THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1777.] LONDON, JUNE 1, 1897. [49TH YEAR. PRICE 6d.

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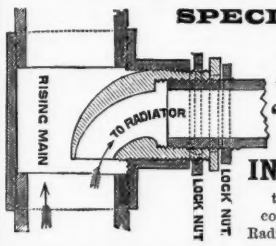

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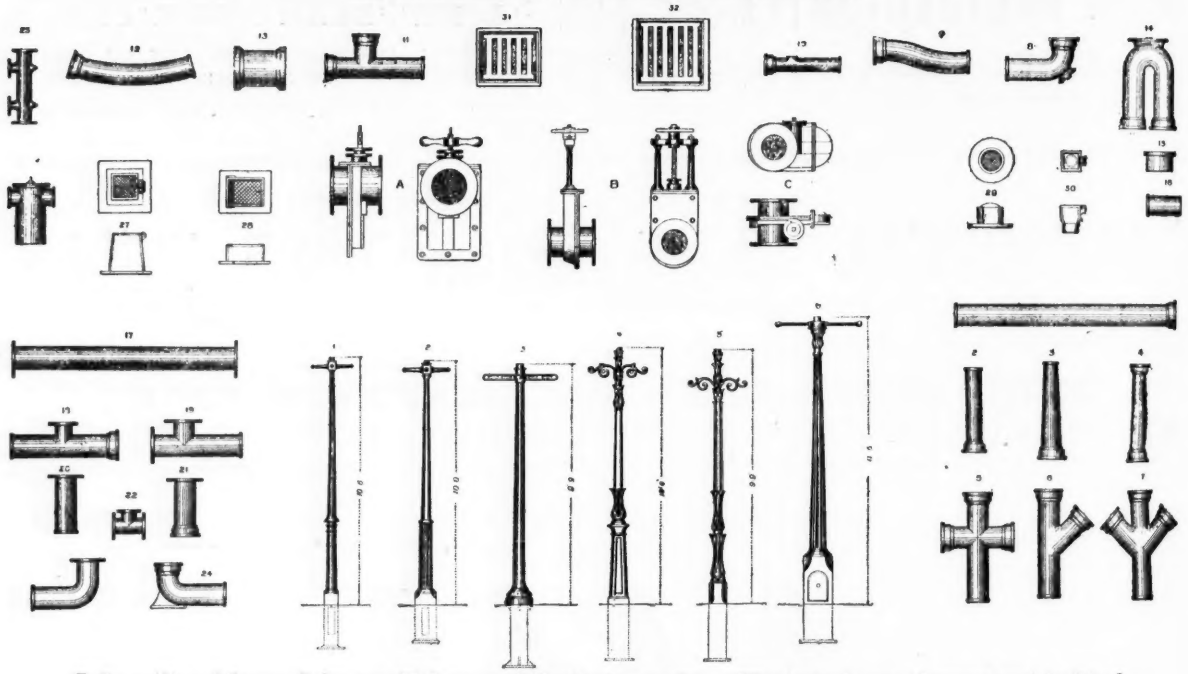

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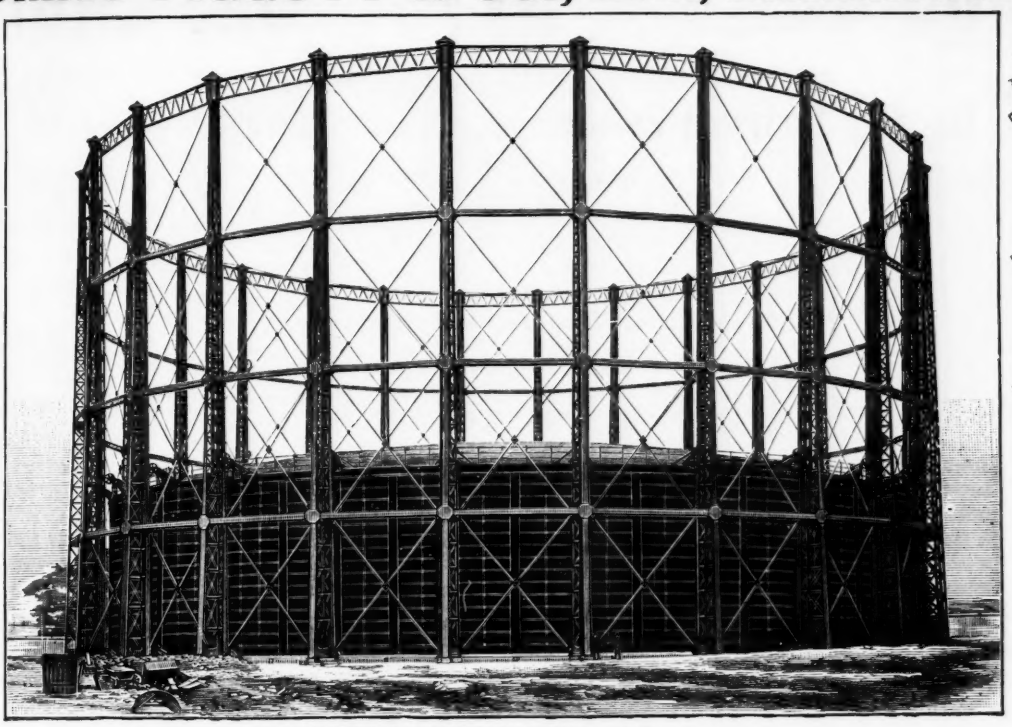

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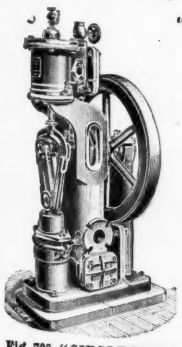

Fig. 705. "SINGLE RAM" STEAM-PUMP.

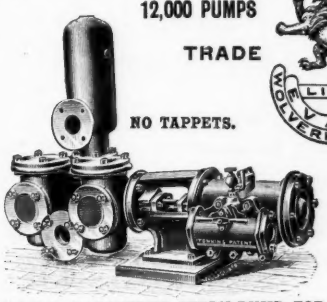

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

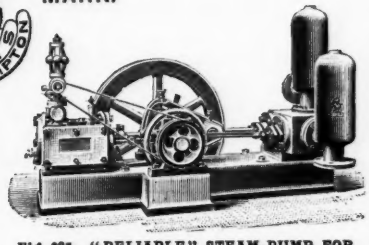

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

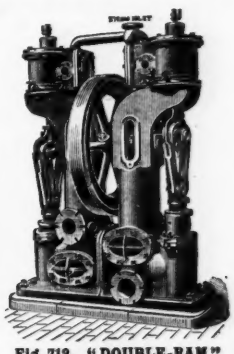

Fig. 712. "DOUBLE-RAM" STEAM-PUMP

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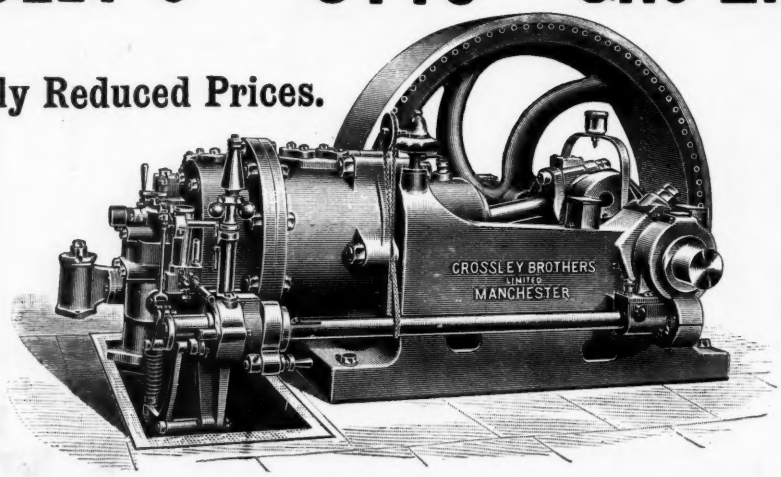

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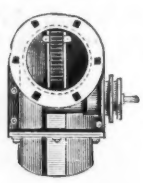

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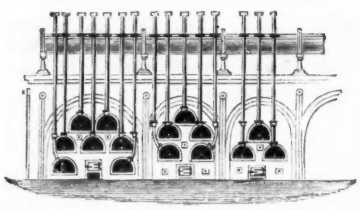

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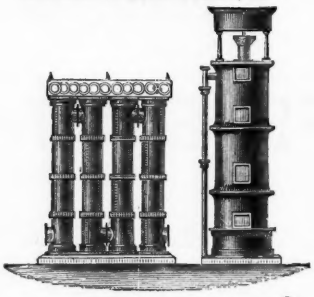

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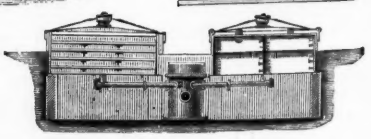

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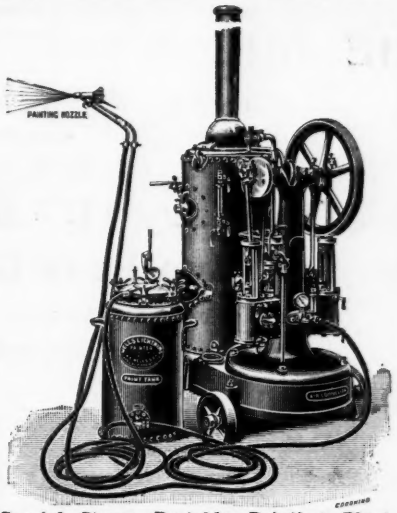

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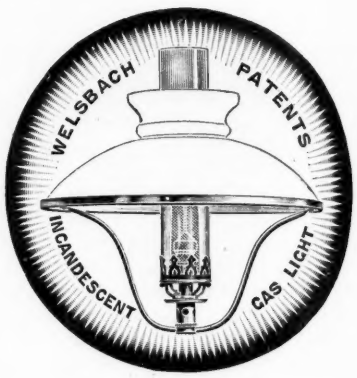

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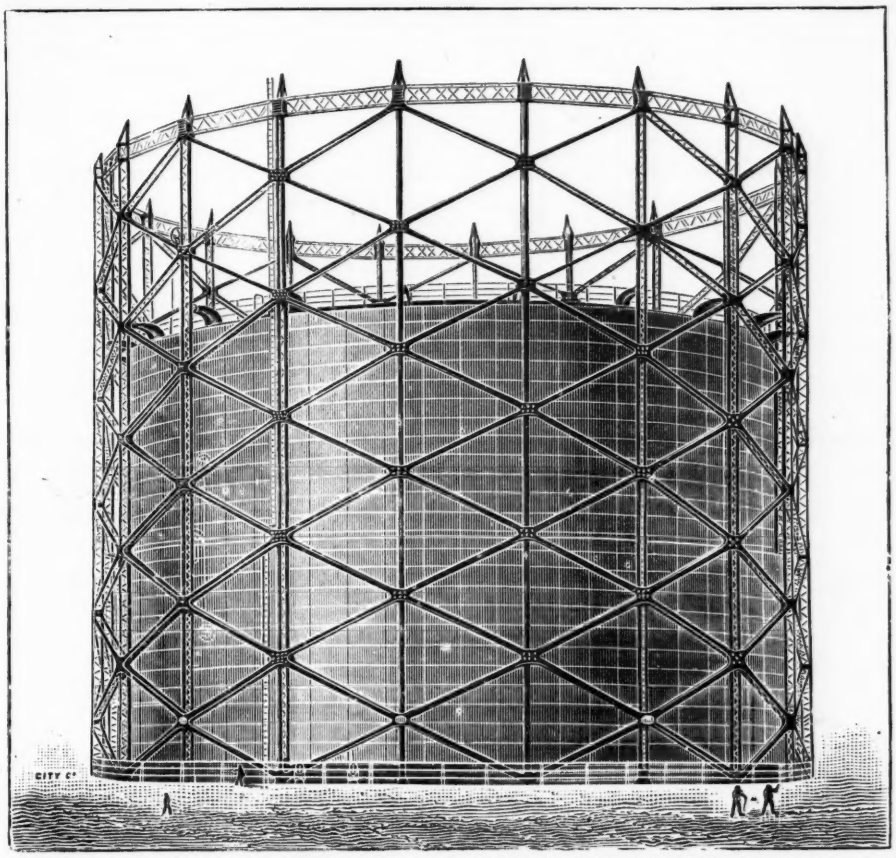

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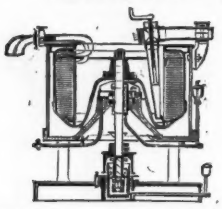

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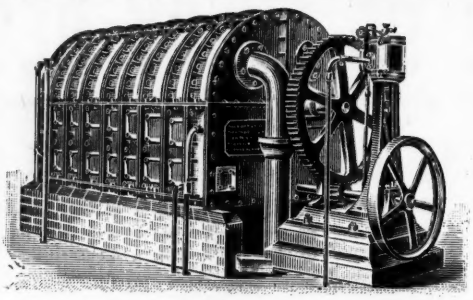

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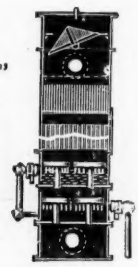

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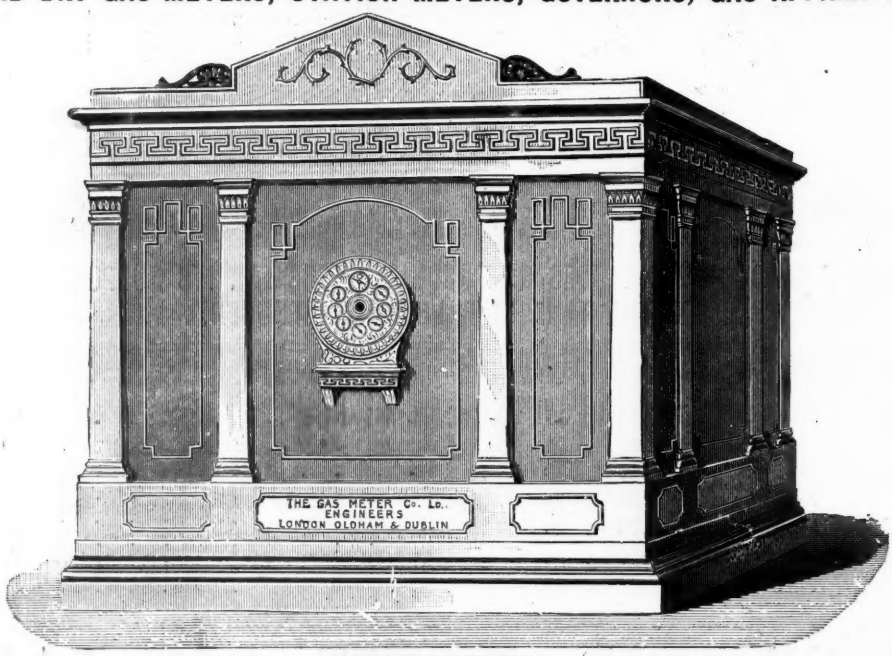

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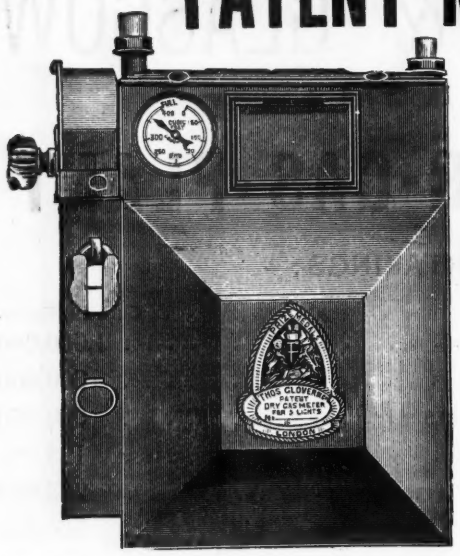

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TO CORRESPONDENTS.

Owing to the WHITSUN HOLIDAY, communications should reach the Office not later than the first post on SATURDAY next.

EDITORIAL NOTES.

In Committee on the Workmen's Compensation Bill.

THE House of Commons has settled down to hard work in Committee on the Workmen's Compensation Bill; the notice-paper being crowded with amendments, mostly of a substantial character. It is not too much to say that the House is seen at its best in this kind of business, when everybody is engaged in the fabrication, line by line, of a measure of practical utility, and the mere chatterers and notoriety-mongers who usually receive so undue a share of attention by the reporters for the newspapers are out of the way. The first piece of work upon the Bill itself was done by the Speaker, on the order for going into Committee; and it had reference to the modern practice of moving "instructions" in respect to this stage of procedure. Fortunately, the limits within which an instruction to a Committee must be confined are both narrow and rigid; and, consequently, of all the instructions put upon the paper in this instance, only one was passed by the Speaker as in order. This was a proposal to empower the Committee to insert clauses securing compensation to workmen for injuries to health arising out of and in the course of their employment. The justification for a proposal of this kind is not far to seek. Unhappily, there are trades which are detrimental to the health of those who are engaged in them; and so long as it is found necessary to carry on these trades, so long will people suffer varieties of industrial martyrdom in our midst. There is point, however, in the contention that it is inexpedient to load an Accidents Compensation Bill with provisions relating to industrial sanitation. The House took this view, and rejected the instruction. The next suggestion that occupied the attention of the Committee was one for removing the various restrictions proposed by the Bill with regard to the classes of workmen to whom it should be applied, and so making it practically universal by including every class of trade and employment with the exception of domestic and menial servants. The effect of this enlargement of the scope of the Bill would have been to seriously jeopardize its chance of passing into law this year; and for this reason it was decided to keep the Bill within the limits originally drawn. These are sufficiently wide for an experiment, as it is estimated that over six million workpeople will be directly affected by it.

Mr. Seton-Karr raised a hubbub of excitement over his proposal that no compensation should be payable to a workman in respect of any accident caused by his own wilful and wrongful act. Mr. Chamberlain at once admitted that justice demanded the amendment. Obviously, it would be most unfair, as Mr. Chamberlain observed, "that a man who had deliberately disobeyed, in the most "flagrant way, an order given to him, and had thereby "caused injury to others as well as to himself, should "be himself compensated for his wilful or wrongful act." On the other hand, there arises the question of expediency, as to whether, for cases which must necessarily be rare, it is worth while in practice to make any exception of a character likely to lead to dispute. Opposition to the proposal of Mr. Seton-Karr was based upon the latter consideration; and all the Labour members joined in declaring that if the exception were made, the heart would be taken out of the Bill. It would, they declared, be so easy for employers to put upon the workman the blame for accidents. On the other hand, nobody could be found to uphold the disobedient workman's claim to be pecuniarily compensated for the consequences to himself of an act for which he might be liable to be criminally prosecuted. After a great deal of discussion, it was decided to reserve the question in order that the legal advisers of the Government might draft a form of words to express the general opinion of the House on the point; and this was subsequently done. The new clause runs as follows: "If it is "proved that the accident is solely attributable to the "serious and wilful misconduct of the workman himself, "any compensation claimed in respect of injuries to such "workman shall be disallowed." The amendment was accepted by a large majority.

Another important question is that of the notice required and the limitation of the period for making claims. Mr. J. Wilson (Falkirk), from experience of the working of the Employers' Liability Act in Scotland, proposed three months as the period during which notice of claim

must be lodged. On the opposite side, it was urged that nothing gives rise to more litigation than these compulsory notices. This is a matter in regard to which the practice of workmen's mutual benefit societies might be supposed to guide the House; but it was not so. Originally, the Government decided not to put into the Bill anything about notices, for fear of doing more harm than good thereby. Good entertainment can be had by those who can spare the time for reading the contributions of the lawyers in the House to the debates. On the provision which states that the employer is not to be relieved of any responsibility that may rest on him by reason of his having caused an accident by his own wilful and wrongful default, Mr. Lawson Walton declared that the consequence would be that wherever the presumption existed that the employer was to blame he would be tried twice over. He was opposed by Mr. Bucknill, who expressed his doubt whether his honourable and learned friend opposite had read the clause with very much attention. Mr. Atherley-Jones professed his inability to understand the Bill. This brought up the Attorney-General to explain and defend it. The result of the legal argument was that the Government agreed to consider at a later period any practical suggestions for simplifying procedure, and at the same time cheapening it. A difficulty in the way of following the proceedings of the Committee is created by the continual repetition of the expedient of postponing amendments from one day to another in order to frame clauses in terms agreeable to all parties. This was done again in regard to the question of notices. The Government thought it fair that employers should have some notice of claims within a reasonable period after the occurrence to which they referred; but they did not like to make the giving of such notices a condition precedent. A new clause was framed to cover this point; and it was accepted by the Committee.

The last argument for the week was upon the old trouble of "contracting out." The Bill provides that where the Registrar of Friendly Societies certifies that any scheme for compensation or mutual insurance between employers and employed is, on the whole, not less favourable to the workman than the provisions of the Bill, he may elect to take the former. This permissive clause is objected to by a section of the House. The gravest objection to it is that cases might arise in which men would be compelled to join the employers' society as a condition of their employment. But, as Mr. Chamberlain well pointed out, it will be practically impossible to legislate against the exercise by employers of discretion as to what conditions of employment they shall insist upon. On the whole, fair progress was made with the Bill last week. Many highly debatable points have been disposed of; and though there is a dense thicket of amendments to be gone through, the Committee will gather momentum as time passes.

Rejection of the Stirling Gas Transfer Bill.

A HARD fate has befallen the Stirling Burgh Gas Bill, which was to authorize the acquisition by the Burgh Commissioners of the undertaking of the Stirling Gas Company. The circumstances are exceptional. The Company not only do not possess statutory powers, but are not even incorporated as a joint-stock undertaking. They remain a body of copartners who conduct the business of supplying Stirling with gas, just as they might carry on a brewery. They have done very well for themselves, and not badly by the public. For upwards of twenty years the question of buying up the gas-works has been more or less before the Local Authority; and at length, in 1895, definite steps were taken in this regard. It appeared to be the general opinion of the inhabitants that the town should acquire the undertaking; and the Company were not unwilling to sell at an agreed price, but they objected to being subjected to compulsion. Mr. James M'Gilchrist valued the property, for the Commissioners, at £61,000; and the Company had their own valuation made, which worked out to £68,000. This was no great difference; and upon the matter being referred to a limited arbitration, the correct value was found to be £62,697, upon which both parties agreed. This price was put in the Bill which the Commissioners promoted in due course, but without referring the question to a poll of the ratepayers. This omission, taken in conjunction with other circumstances, caused the rejection of the Bill. It is true that at the last November elections of Commissioners the question of the gas purchase was made a test one, and a majority favourable to the purchase was returned. The case made out before the Committee for carrying out the agreement was, in our judgment, strong enough to convince any such tribunal that, in confirming the bargain proposed, they would be doing a good thing for the town. But there was the fatal objection of irregularity in the Commissioners' method of procedure; and this proved insurmountable.

Mr. Blennerhassett, for the opposition, did not call any witnesses, but argued that this municipal body had exceeded their powers, and had not proceeded, as they might have done, under the Burghs Gas Supply Act. The Commissioners had not thought fit to take a popular vote upon the proposed purchase; but the opposition had done so, with the result that about a thousand objectors were found to take the trouble to notify their view by post-card. Moreover, Counsel was able to state that at the meeting of the Town Council on the 4th of December, when it was resolved to proceed with the Bill by a vote of ten to nine, three members of the majority were shareholders of the Gas Company. If these had refrained from voting, the motion would have been lost. In these circumstances, the Committee had no other course open to them than that which they took, of declining to proceed with the Bill. After all that has been circulated about the illegality of gas shareholders voting as members of a local authority upon matters in which they are pecuniarily interested, albeit in the most insignificant degree, it is marvellous that the Stirling Town Council should have committed the very serious blunder imputed to them in this connection. Since it has not been denied, the fact must be taken to be as stated; in which case, of course, the Town Council vote was absolutely without legal force.

The public will not suffer from the parliamentary failure of their representatives, inasmuch as they will obtain their gas from the Company as usual. It has now become necessary for the Company to go to Parliament on their own account next session; and then their true position will be settled. So far as can be gathered from the history of this Stirling mischance, the behaviour of the Company has been inspired throughout with public spirit and every regard for the interest of the town consistent with their duty towards their own shareholders. The town would have had a fair bargain if the works had been transferred upon the agreed terms. There would not have been a great deal in it, of course; for the days of cheap gas property are past, and are not likely to return. If the good people of Stirling flatter themselves that they are ever likely to obtain control of the gas supply upon easier terms than those of Sheriff Lees' award, they are utterly mistaken; and in all probability before many years elapse they will be blaming themselves for the shortsightedness of this session's performance.

The Engineering Conference.

THE Engineering Conference held in Westminster last week by the Institution of Civil Engineers was a very great success, and abundantly justifies the Council of the Institution in opening up this new development of the old organization. It was a good idea to make this exhibition of the strength of the Institution; but the idea might very easily have been spoilt in the execution. Credit is therefore due to the Council and the Secretary (Dr. J. H. T. Tudsbery) for the excellence of all the arrangements, and for the liberality with which the sectional meetings were thrown open to the professional world and the Press. There is evidently a strong transfusion of new blood into the Institution; and the old obscurantism is being abandoned. For the success of a scientific or technical congress three elements are essential—men, matter, and publicity. All three were present at last week's gathering, with the consequence that there was nothing but praise on all hands for the Institution and those who so loyally co-operated with the Council in carrying out the excellent programme of the first Conference. May this prove to have been the first of a beneficent and enjoyable series of annual engineering congresses. In holding such conferences, the Institution, as the President, Mr. J. Wolfe Barry, observed in his brief Inaugural Address on the present occasion, will not be trespassing upon any field previously occupied. They will always be held in Westminster, to begin with, and thus they will not interfere with the annual meetings of the peripatetic societies

to one or more of which most active members of the Institution itself also belong. Neither will they tap any of the sources of new technical literature which supply the usual tale of papers and memoirs for the Institution, or any more specialized organization for collecting and recording such matter. Long papers and communications running into detail are out of place at such assemblies, which fulfil their true purpose in calling the time of day in regard to matters of common practice. This is best done, as last week's proceedings show, by some acknowledged master of a subject stating in the fewest possible words how it actually stands, and then allowing all and sundry to express their views respecting the matter. In this way the concentrated essence of contemporary knowledge concerning a great number of engineering questions was not only gathered from many minds last week, but was promptly reduced to print, and put in circulation throughout the world. The latter consideration is of vast importance. The Institution of Civil Engineers having at last recognized the fact that it is fatal to the interest of professional meetings to smother up everything that is said until the whole thing is stale, it is to be hoped that no other society of a similar kind will be tempted to perpetuate this stupidity. The days of any such society would be few and evil.

The Report of the Birmingham Gas Committee.

In another column to-day will be found the substance of the annual report of the Birmingham Corporation Gas Committee. The most salient feature of the statement is the indication it affords of the wonderful growth of the undertaking. Birmingham Corporation gas is in such great and growing demand in every part of the large and busy area supplied by the different works, that the Committee have as much as they can do to make the necessary provisions for meeting the calls upon their resources which come from all directions. If anybody wishes for further evidence that those British industries which centre in Birmingham as their Commercial Metropolis are in a more flourishing condition than ever, the report under notice will supply all that can be desired in this regard. The detailed figures of the accounts are not given in the abstract; but it appears that out of the gross profit balance of £134,125 a subsidy of £30,000 is payable in aid of last year's city improvement rate, besides which a contribution of £11,783 is to be made in aid of general public lighting within the city, and the sum of £2391 is to go towards the cost of better lighting the courts. The Committee will also aid in the lighting of streets and courts outside the city to the extent of £3560. Altogether, the gas profits will help the public purse to the amount of £57,734—not perhaps, an exorbitant sum as compared with the practice of some smaller municipalities. Meanwhile, the incessant operations concerned with the improvement of all the works, and the progressive amelioration of the conditions of employment of all orders of gas workers, constitute a burden on the revenue, which, with their other responsibilities, makes the work of the principal advisers of the Gas Committee ever more arduous as time goes on.

The Report of the Chief Inspector under the Alkali, &c., Works Acts.

The Chief Inspector under the Alkali Works Regulation Acts has issued his report upon the working of the Acts during the year 1896. These annual statements have not suffered in interest since Mr. R. Forbes Carpenter has been in charge of the operations. With regard to sulphate of ammonia works, the report discusses the progress made at the Luton Gas-Works in the experimental working of oxide of iron purifiers with concurrent revivification by regulated steam and air admission. Mention is also made of the introduction by Mr. May into the Richmond Gas Company's sulphate works of a new form of change-valve, which has the merits of being easy to lift and turn, and of never leaving the foul-gas main unsealed. The Chief Inspector has carried out an investigation into the constitution of ammoniacal liquors from various sources, using Mr. Lewis T. Wright's method; and he gives a tabulated statement of the results obtained, which are worth careful study. Consideration of the production of ammonia in gas-works leads up to the observation that the introduction of carburetted water-gas plant into British gas-works has already attained such dimensions as to affect the sulphate statistics. The words of the report are: "Already the amount of ammonia recovered from gas-"works does not show the natural rate of increase corresponding to that of gas made, as it would if all the latter "were derived from coal instead of being partly due to "the interaction of incandescent coke and steam." The Inspector refuses to discuss the vexed question of the increased toxicity of carburetted water gas as compared with coal gas; but he suggests the extended use of the oxygen cure in cases of gas poisoning in private houses. We shall return to the consideration of this report on a future occasion.

WATER AND SANITARY AFFAIRS.

Mr. Chaplin claims for his Metropolitan Water Companies Bill that—while it is short, simple, and modest—the new powers and duties which it is adapted to confer on the Local Authorities are very considerable. We apprehend the Bill may serve to show how little need there is for any such legislation. Its chief effect islikely to be found in disposing of grievances which are made to serve the purpose of a noisy agitation, but which have no real foundation in fact. Consumers who think they have cause to complain are to be enabled, by the Bill, to invoke the aid of the Local Authorities in order to carry their case before the Railway and Canal Commission. This seems to be an odd tribunal for such a purpose; but the Commissioners are said to be in want of something to do, and for a while the new Act may give them a little employment. The measure has been received with mild approval, and will doubtless become law. If it will let in more light on the subject, the Companies may welcome its appearance. It will be noticed that Sir Joseph Pease is not satisfied. He wants something bigger and grander; and he talks about grave difficulties which will arise before very long from the present position of affairs relative to the water supply. But Sir Joseph must wait for the report of the Royal Commission, when the broader issues of the question will not fail to be brought forward. The Bill is avowedly but a temporary measure—presuming that the Royal Commission will induce a change in the aspect of affairs. For a change of some kind Sir Joseph pleaded in the report of the Select Committee on London Water Bills last year; and his leaning is, of course, in favour of a "representative body" in place of the Water Companies. With this matter the Royal Commission will have to deal. As a germ of control, perhaps Mr. Chaplin's modest measure will herald the final settlement. But we are bound to add that there appears something which calls for careful consideration in the third clause of the Bill, by which it is proposed that the Metropolis Water Acts of 1852 and 1871 shall apply to the outer areas. It appears also that the operation of the Bill is to extend to these areas; and it will be seen that clause 2 includes the question of "charges."

Sir Frederick Bramwell has addressed a letter to "The "Times" for the purpose of explaining the nature of the sinking fund legislation affecting the London Water Companies. The explanation is about equal to a problem in Euclid; but the Act of Parliament is shown to have an effect which most people can appreciate, when it is once fairly brought within the range of ordinary comprehension. The so-called sinking fund is practically formed out of a penalty inflicted on the Companies whenever they undertake to extend their works and have to raise capital by means of debenture stock. The burden falls on the shareholder, inasmuch as a deduction is made from income in order to form the sinking fund. The City Chamberlain is the trustee of the fund, and is to deal with it for the purpose of ultimately extinguishing the capital of the Companies. Sir Frederick asserts, with perfect warrant, that the provisions of the sinking fund "are difficult to be "understood." They are so difficult of comprehension that the Chamberlain himself did not understand them at one time, and was prematurely engaged in extinguishing the capital of the Companies, thereby helping the dividend. Of course, this process was soon stopped; and one of the results to be anticipated from the plan now in operation is the extinction of the West Middlesex "rebate." By forcing on a redemption of capital where no such redemption was required, the Legislature has put an unnecessary burden on the London Water Companies, and one which, as Sir Frederick contends, inflicts "a heavy fine on a water "company for endeavouring to benefit the public."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1259.)

THE Stock Markets, instead of becoming more active, were very quiet last week; and again the long looked for revival is among the postponed events. There was some amount of realizing where profits could be snatched; but altogether the volume of business was decidedly light. Prices consequently suffered to some extent; but in special markets an improvement was to be found—the American being noticeable in this respect. The settlement, which was satisfactory, was the principal event; and fresh business was much avoided—the approaching holidays being thus early discounted. The Money Market was much firmer; there being a good demand in addition to what was wanted in the Stock Exchange, and rates are looking better. Business in the Gas Market was only very moderate; but the general tendency was firm. A few quotations have advanced on their last week's figures, and none moved in the other direction. In Gaslights, the "A" opened unchanged, but gradually hardened a little, and marked 314 several times. It stuck so resolutely to this figure, that the quotation was put up a point; and the closing prices were firm. A few transactions were recorded in the secured issues at good middle figures; but they showed no disposition to advance. South Metropolitan was moderately dealt in at a steady price rather better than the middle figures. Nothing at all was done in Commercials. Transactions for the new account no longer carry the right to allotments of fresh capital; and the prices of the old and new stocks have, in consequence, been proportionately adjusted "ex new." Little was done in the Suburban and Provincial division; and the only change was in Brentford old. The price of this had, through sheer inactivity, long stood below the level of the new stock; but a transaction at 300 put it into its proper rank. Moderate business was done in the Continental Companies at good steady figures. The closing mark—216—of Imperial was the best of the week. Union and European were also firm. Among the rest, the only variation was an advance in Belgrano debenture and Buenos Ayres. The Water Companies were very quiet indeed; but a good tendency was apparent almost throughout the list. Chelsea, Lambeth, New River, and Southwark had a moderate advance.

The daily operations were: Gas opened on Monday at unchanged figures; and after moderate business, closed without any alteration. Tuesday's business was rather quieter; and though the prices marked were very good, yet quotations did not advance. In Water, Lambeth tens rose 2. Gas stocks on Wednesday continued to command firm prices. But business was much restricted; and the only move was a rise of 2 in Belgrano debenture. On Thursday, business in Gas continued to be very limited; but quotations rose. Gaslight "A" and Brentford old improved 1 each. In Water, New River gained 1; and Southwark, 2. There was no increase in activity on Friday in Gas; but prices were very good. Brentford old rose 9; and Buenos Ayres, ¼. Saturday's transactions in Gas showed general strength; but quotations remained unchanged. In Water, Chelsea advanced 3.

ELECTRIC LIGHTING MEMORANDA.

Rejection of the Swansea Triple Scheme by Parliament—Gas Companies' Opposition to Electrical Schemes—Weakness of the Swansea Project—The Magnanimity of the Engineer.

THE rejection of the Swansea Corporation Tramways Bill by the House of Lords' Committee is to be recorded as a triumph of common sense and fair dealing in matters municipal, over plausibility and individual interest. We have on previous occasions mentioned and criticized the scheme embodied in this Bill; but it may be as well to recapitulate the substance of it as explained to the Committee by Mr. Freeman, for the promoters. It was stated that the Bill was primarily to empower the Corporation of Swansea to purchase the undertaking of the Swansea Improvements and Tramways Company. The terms of the agreement to this effect which Parliament was asked to sanction, contemplated the purchase of the existing tramway for £32,000. Additional lines of tramway were to be made by the Corporation; and the Company were to lease the whole for 21 years. A further condition was that the Corporation were to supply electrical energy to the Company for working the tramway at the rate of 2d. per unit for 600,000 units supplied in the year. If the Company took 750,000 units, the price was to be 1¾d. per unit; and for any greater quantity, 1½d. per unit. It was explained that the Corporation already possess electric lighting powers, which they have hitherto been afraid to exercise on the ground of expense. If, however, they could get the Company to take this large quantity of electricity, it would enormously reduce the price at which the electric light could be supplied in the borough, and enable the Corporation to perform this service more cheaply than any other local authority in the kingdom. But this was not all. The Corporation also proposed to buy certain lands on which to erect a combined electricity generating and refuse destructor plant, which was expected not only to be a convenient arrangement, but also to save £400 a year. The tramways had not hitherto been very lucrative. They had been worked by horse power, and the service had not been sufficiently regular or convenient; while the lines had not extended far enough in several directions. If the scheme in question were passed, all these things would be put to rights at once, and Swansea would be placed in an unrivalled position as regards electric lighting, tramway service, and refuse destruction.

It was a grandiose combination; and the promoters probably thought to impose it upon the Lords as something altogether too good to be spoilt by a Select Committee of Parliament. If Wales only had Home Rule, how largely the Corporation of Swansea would bulk before any provincial legislative body! But on the present occasion the Corporation's case began to crumble to pieces the moment Mr. Freeman was succeeded by Mr. Balfour Browne, who accused the Corporation of having "gerrymandered" the necessary statutory preliminaries. In the concluding part of his address, Counsel for the Corporation had stated that practically the whole of the opposition to the Bill came from the Swansea Gas Company, who were alarmed for their own business. It is very unwise for promoters of Electricity Supply Bills to take this line before a Parliamentary Committee. Such partisans appear to be under the delusion that they can get a discount on opposition on the merits of a scheme by showing that the gas interest has something to do with it. But they are usually undeceived before their business is done with. Parliamentary Committees are accustomed to, and expect opposition to be at least as interested as promotion. The last thing a Committee can be prevailed upon to believe is that any commercial enterprise is being promoted solely in the public interest. It is different, of course, with purely sanitary or police legislation; but even in such cases, Committees are not wont to cherish illusions. Gas companies can never expect to receive attention if they should oppose municipal electric schemes merely as business competitors; and we have never heard of their doing so. A gas company, however, is as a rule one of the largest ratepayers in the district; and gas directors and their advisers naturally know more of the true nature of municipal projects than mere outsiders.

In this Swansea case, there was good reason for the Gas Company and other responsible owners and ratepayers appearing in opposition to the Corporation project. The opponents alleged that the so-called triple scheme was of a highly speculative character; that the financial condition of the borough did not justify the Corporation in undertaking anything of the kind; that the poll taken did not represent the ratepayers' feeling; and that nearly all the schemes of the Corporation for the benefit of the town had resulted in financial failure. The most serious—and, as the event proved, the fatal—objection to the Bill was that the poll had not been properly taken, and that the ratepayers were not in accord with the Corporation respecting the scheme. Nevertheless, the Committee decided to hear the evidence; and very curious some of it was. The Corporation had engaged Lord Kelvin; but the result was not such as to justify the policy of bringing in big names to the support of schemes which the celebrities know little about. The Committee were much more impressed with the circumstance that Mr. Manville, the author of the scheme in his capacity of electrical adviser to the Corporation, is also a partner in the firm of Kincaid, Waller, and Manville, the Consulting Engineers of the Tramway Company. Even these experts, and the others who were brought in to bless the triple scheme, could not deny that it would involve the Corporation in certain and very heavy expense, while the returns were distinctly hypothetical. Eventually, as stated, the Committee decided that the preamble of the Bill had not been proved—a conclusion that was inevitable upon the promoters' own evidence. If the effect of this rebuff to the Corporation of Swansea should be to convince the partisans of electrical schemes and their municipal allies that illusive pretence and sharp practices to evade the Borough Funds Act are at all times inexpedient, something will have been gained.

It is with much pleasure that we have to acknowledge a magnanimous act on the part of Mr. John S. Raworth, the well-known Engineer to the Brush Company, and designer of the excellent pattern of steam-engine that bears his name. It has reference to the alleged failure of the gas-engine power station at Coatbridge, which has greatly exercised the minds of some electricians who seem not to be able to endure the name of gas, even as a source of power. It having been reported that gas power at Coatbridge had proved a failure, and that it had been necessary to replace the gas-engines by steam motors, the impression has been created that the system was at fault. Mr. Raworth, however, has almost gone out of his way to deny this. He writes to the "Electrician" declaring that the point of the lesson of Coatbridge has been missed. He says: "No one will accuse me of having any interest in gas-engines, or in their successful application to electric lighting; but as I am an engineer by profession, I desire in common with all engineers, that every new development should have fair play." On this ground, he proceeds to show that all the troubles with gas at Coatbridge arose from accidental circumstances—"mere drawing office errors," he calls them. His opinion, therefore, of the experiment at Coatbridge is that "it showed nothing whatever as to the comparative value of gas plant, but that it demonstrated

most clearly that Messrs. Dick, Kerr, and Co., the Contractors, were prepared without any compulson to fulfil their obligations to the letter." This is a manly, straightforward statement from one who, as he says, has no other interest in the subject than that of a professional man in the establishment in all cases of the truth of experiment. Mr. Raworth does not, we may be sure, desire to be complimented on his letter; but the high standard of professional feeling which it exhibits, is not so common that its existence can always be taken for granted.

THE FIRST ENGINEERING CONFERENCE.

The Council of the Institution of Civil Engineers are to be congratulated without reserve upon the great success of their first Engineering Conference, held in Westminster last week. The idea of calling such an assembly together was an excellent one; and the arrangements made in regard to it were admirably conceived and executed. It was the first undertaking—not merely of the kind, but of any kind, determined upon by the governing body of the Institution for the benefit of the general body of members and the engineering profession at large; and the successful issue of the experiment must convince the Council as to the wisdom of the new departure. It was scarcely to be credited at first that the stiff and formal Institution, which has hitherto appeared to exist chiefly for the benefit of the Great George Street contingent of the profession, really meant to give facilities for the gathering together of all followers of the craft in free and open session, with a view to placing in evidence the actual state of civil engineering in all its branches in this *annus mirabilis*. The event, however, proved that the Council not only meant to do this, but to do it well. The response to the invitation was of a gratifying character. Hundreds of engineers found themselves able to justify in their proper persons the liberality of the Council, and to prove their loyalty to the Institution; and the character of the sectional transactions triumphantly vindicated the principles upon which the programme was framed. At last, it may be said, the ideal engineering conference has been held; and the Institution of Civil Engineers has the credit of the event.

It is unnecessary for us to describe the proceedings as a whole. That portion of the transactions in which our readers are most particularly interested came under the Sixth Section, of which Mr. James Mansergh was President. There were no papers, strictly so called; but it was arranged that every subject on the *agenda* should be opened for discussion by a leading authority, whose "notes" were condensed into a single folded slip, occupying seven or eight minutes to read. Copies of these notes were distributed freely; and full permission was accorded for the reporting of the discussions. The effect of this enlightened policy—quite a revolution in the case of the Institution—is not merely that we are able to give our readers a complete report of the proceedings, so far as they especially concern them, but also that the discussions themselves were terse, pointed, and marked the actual contemporary state of knowledge of the subjects. We do not know how the other Sections fared; but it is certain that Section VI. was a splendid success, and offered convincing testimony to the excellence of the liberal system adopted by the Council.

As we have frequently observed when referring to the conduct of technical meetings in general, the discussion is the thing to be secured if possible. Long papers are, as a rule, a mistake. Any detailed communications, descriptive or statistical, should be preserved in the form of appendices to the Society's "Transactions," which order of publications should in the main be a record of what the Society itself does. That is to say, the thing should more nearly correspond to the name. Experience goes to prove that, without an introduction of some kind, it is practically impossible to get a good discussion. The method adopted at this conference was exactly what was required in this regard. Take the subject of carburetted water gas, put down to be introduced on Wednesday morning by Mr. Corbet Woodall. Everybody interested in the matter knows that Mr. Woodall is a master of the subject; and he managed to put the gist of the whole thing before the Section in a very few sentences. Thereupon—Mr. George Livesey being for the time in the chair—a really brilliant discussion sprang up, which brought out in clearest relief the various questions that underlie the prospects of carburetted water gas manufacture in England. After this came Mr. J. Emerson Dowson, who opened up the subject of the application of gas as a source of power; and again the matter was elucidated as it had perhaps never been before. In the course of the discussion, Mr. Humphrey, who spoke as a representative of the Mond gas system, made the astounding declaration that the electric lighting of Northwich is to be worked by Mond gas supplied to the central station at the price of 2d. per 1000 cubic feet.

We do not propose to paraphraze the brief statements of the introducers of the various subjects to the conference, nor the observations of those who took part in the discussions. The whole of the proceedings were of a most businesslike character throughout, and appeared to be thoroughly appreciated by all and sundry who attended, from the veteran ex-President of the Institution, Sir Frederick Bramwell—apt of speech as ever—to the youngest associate member. It is to be hoped that this meeting marks the beginning of a new era in the life of the Institution—an era of more extended usefulness, of greater and more deserved popularity, of closer accord of the working of the Institution itself as a whole and in every part with the needs and condition of civil engineering as a science and as a profession. For the perfection of the arrangements of the conference, praise is justly due to the Secretary, Dr. Tudsbery, and his staff.

THE THEORY OF INCANDESCENT GAS LIGHTING.

In a recent number of the "Zeitschrift für Beleuchtungswesen," there appeared a communication from the pen of Dr. Moscheles, of Friedenau, near Berlin, on the cause of the intense development of light by Welsbach mantles in a gas-flame. The views expressed by the author are of considerable scientific and technical importance, and have special topical interest on account of their bearing on the validity and scope of Dr. Auer von Welsbach's German patents. In the following abstract translation of the article, the portions dealing with the question of patent rights in Germany, which are not of general interest, have been greatly abbreviated.

It is now quite customary to apply gas for lighting purposes through the agency of mantles, or bodies of special structure which are made incandescent, instead of by means of the ordinary luminous flame. In the latter case, decomposition of the hydrocarbons of the gas occurs; and it is associated with separation of carbon in very fine particles, and liberation of heat, which gives to the flame its luminous character. The introduction of an inert gas to the flame will, under certain conditions, so diminish the zone in which unconsumed carbon is found, that the flame will no longer be luminous. This is the case also with the bunsen burner, by which complete combustion of the gas occurs within a limited area, and the local development of heat is very great. The total heat generated in a luminous flame is all but equal to that produced in a non-luminous flame consuming the same quantity of gas. It is actually less by the very trifling fraction of the total heat which is lost through radiation in the form of light. The irrational character of ordinary gas lighting is shown by the very small portion of the total heat developed which is actually used in the attainment of the desired technical end—viz., the production of light. Nearly the whole of the electromotive force applied is converted into light by the incandescent electric lamp. The incandescent gas-light occupies a mean position between the luminous gas-flame and the electric light. An incandescent gas-burner consuming the same amount of gas as an argand burner develops more light and considerably less heat than the latter. Therefore more of the gas is utilized in the desired direction.

The question then arises: What is the precise nature of the incandescent gas-light? And why does one mantle become luminous and another not? Also why will a mantle of the usual components emit light, and one of different composition fail to do so? Mantles now usually consist of a skeleton of thorium oxide with a small admixture of cerium oxide. Some are made of mixtures with regard to the composition of which secrecy is observed; but in every case the mantle must have a certain power of resisting deformation. But why does the mixture of thorium oxide and cerium oxide emit light, while silica or alumina, or other substances which likewise are unaffected by heat, do not? The theory now propounded answers this question; and it is supported by the analogy of the behaviour of some specially prepared mixtures.

A compound of oxygen with an element is known as an oxide. Some of the elements form with oxygen only one compound; but others combine with oxygen in more than one proportion; as, for instance, hydrogen, which has two oxides—water and hydrogen peroxide. Lead, manganese, cerium, and many other elements, resemble hydrogen in this respect. But thorium has only one oxide ($Th O_2$), and silicon, aluminium, and other elements, also have only one. The elements may thus be classed in two groups according to whether they have one or more oxides. Many of the oxides combine with others in constant proportions, or act as bases towards acids. Thus alumina forms with potash potassium aluminate, in which potash acts as a base and alumina as an acid. Sulphur trioxide and alumina yield aluminium sulphate, in which the sulphur trioxide is the acid and the alumina the base. All substances which thus combine are said to have a chemical affinity for one another. Chromium oxide and alumina have no such affinity, neither have thorium oxide and cerium oxide. On the other hand, alumina has an affinity for cerium oxide; and thorium oxide has an affinity for chromium oxide. In the ordinary incandescent mantles we find thorium oxide is in conjunction with cerium oxide; that is to say, the mantles are formed of two oxides which have no chemical affinity for one another, and one of them (cerium oxide) pertains to a metal which forms more than one oxide, while the other (thorium oxide) is the only oxide which the metal—thorium—forms.

The view now enunciated is that, when such a mixture is brought into the margin of a non-luminous flame, reduction and oxidation take place alternately; or there is a continual transference from the higher to the lower stage of oxidation of the cerium, and again from the lower to the higher. This oscillation between the two states is accompanied by a development

of heat within a limited area, and by a liberation of oxygen *in statu nascendi*. The oxygen provokes within the confines of the space in which it is liberated a much enhanced combustion of gas; and therefore a great increase of heat occurs locally, and raises the mantle to incandescence. If this view be correct, then all systems or mixtures of elements which are in conformity with the principle stated above should be more or less suited for the production of light by incandescence. Experiments have fully corroborated this conclusion. For instance, alumina and chromium oxide are representatives of the two different classes of oxides, and they are also indifferent to one another, and are not volatile. A mixture of these oxides gives a very intense light by incandescence, and is indeed the basis of the Haitinger patent. Similarly a mixture of zirconium oxide and vanadium oxide gives a magnificent light. Of the one class of oxides there are those of thorium, aluminium, silicon, zirconium, and titanium; and on the other hand, of the elements which have two states of oxidation there are cerium, chromium, manganese, vanadium, cobalt, and uranium. A mixture of an oxide of the first class with one of the second class is needed for the development of light by incandescence. This rule is of practical importance, as the selection of materials for the production of mantles must be made in accordance with the above classification. We may remark that, on the strength of the author's work, the use of the bodies as enumerated above for the manufacture of mantles has been protected in England and America. Dr. Killing's study of the luminosity of mantles, lately published,* is, so far as its essential idea is concerned, an unacknowledged, but almost verbal, reproduction of the specifications of these patents.

The observations recorded are of great importance in another sense; for they indicate that the patents of Dr. Auer von Welsbach do not cover the mixture now used in the production of mantles. For the description of an invention is held by experts to extend so far only as it was understood by the inventor at the time he made the invention; and though a mixture of thorium oxide and cerium oxide is covered, among others, by the Welsbach patents, yet some of the mixtures similarly protected are perfectly useless, and show that the inventor had not at that time understood of what mixtures a mantle for the development of light by incandescence should consist. This contention refers particularly to Dr. Auer von Welsbach's German patent of 1885.

OBITUARY.

By the death of Alderman T. B. STALLARD, which took place last Tuesday, the Leominster Gas Company lose their Chairman, and the town a distinguished public man—he having been no less than seven times Mayor. Deceased had just entered his 81st year.

Mr. W. WALKER, J.P., of York, whose death, in his 78th year, is announced, was a prominent member of the York City Council, and had been Lord Mayor of the city. He was a Director of the York Gas Company from 1887 down to the time of his death.

The death is announced of Mr. H. APPLETON, Engineer of the Fareham Water-Works. Deceased had been in the service of the Fareham Local Board and the Urban District Council for forty years—in fact, ever since the water-works for the town were established.

PERSONAL.

Mr. J. O. PASK is relinquishing the management of the Bungay (Suffolk) Gas-Works, in which he will be succeeded by Mr. W. Methven.

The Guildford District Council have appointed Dr. S. RIDEAL as the Gas Examiner; and the Sevenoaks District Council have selected Dr. MARRIOTT to fill a similar office.

The Council of the British Association have resolved to nominate Mr. W. CROOKES, F.R.S., as President for the meeting to be held at Bristol next year. The forthcoming meeting will take place in Toronto.

At the last meeting of the New Mills District Council, appreciative references were made to the work of Mr. E. JONES, their Gas Manager and Surveyor; and it was unanimously resolved to make an addition of £30 a year to his salary for the two offices.

Mr. J. ORWELL PHILLIPS has, in consequence of ill-health, retired from the Board of the Malta and Mediterranean Gas Company, Limited, and the Directors have chosen Mr. BASIL T. MAKINS as a Director for the remainder of the time for which Mr. Phillips was elected.

After the meeting of the Institution of Gas Engineers early last month, Mr. W. FOULIS paid a visit to Homburg for the benefit of his health. He resumed his duties in Glasgow last Thursday; breaking his journey homeward in London to take part in the Engineering Conference at the Institution of Civil Engineers.

Mr. A. A. GARSIDE, who has for some years been the chief assistant to Mr. J. A. B. Williams, the Water Engineer of the Cardiff Corporation, has been selected by the Sheffield Corporation, out of a large number of applicants, to fill the position of Assistant-Engineer for the Little Don Valley works. Mr. Garside was one of the Resident Engineers, under Mr. Williams, engaged in supervising portions of the works at Taff Fawr, whence Cardiff's new water supply is obtained, and acted in this capacity during the construction of the water-works at Barry and Cadoxton. He leaves Cardiff with the best wishes of a large number of friends.

* See "JOURNAL," Vol. LXVIII., p. 1128.

NOTES.

The Actual Condition of the Road Motor.

The latest statement of the actual position of motor traffic on common roads was made in a paper recently read by Sir David Salomons at the Society of Arts. It was remarked that the two chief lessons to be learnt from recent expositions of the question of the adaptability of mechanical traction to common road carriages are that few modern patents in connection with the subject are original; and that the tendency of constructors is to revert to the better types of the practice of 1820-30. Sir D. Salomons explained the conditions to be fulfilled by motor cars in order to compare with horse traction; pointing out that whereas the horse is able to exert his maximum power in starting, all known oil and gas motors possess the defect of needing to start light, and must then be geared to the carriage while running at considerable speed. Great pains have been taken to achieve success in starting and stopping oil and gas engines placed on carriages, when passing through traffic; but nothing is to be gained in this way so long as the motor has to be kept running at all times during temporary stoppages. The electro-motor possesses certain advantages of easy stopping and starting, inasmuch as accumulators have a reserve power similar to the steam-engine; but this involves wear of the accumulator. With the steam-engine there is great reserve of power. It was pointed out that the secret of success of railways does not lie in the locomotive, but in the character of the road; so that there is no arguing from railway to common highway traffic. After a careful study of every self-propelled carriage that has been made from the earliest times to the present day, Sir D. Salomons has come to the conclusion, with Sir F. Bramwell, that the disposition of the working parts in Hancock's steam omnibus cannot be improved upon. He has pointed this out to M. Serpollet, who is building his latest carriages on these lines. He has further concluded that steam power is by far the most suitable and advantageous for real work; and that when the Serpollet boiler, or one of a similar type, is employed, nothing more can be desired for many years to come. The fuel employed is heavy petroleum.

Balance in Gas-Engines.

Discussing the design and construction of internal combustion motors, Sir D. Salomons divides all machines of the kind into balanced and unbalanced. By "balanced" he does not refer to the parts of the machine being duly poised, as, for instance, by placing additional weight on some part of the fly-wheel, to balance the weight of the crank and any rods on the opposite side. He uses the expression with regard to the mode of operation of the primary force. For example, the gas-engine is unbalanced, which makes its running spasmodic; and this can only be overcome by the expedient of enormously heavy fly-wheels—so heavy, indeed, that in practice a certain amount of jerkiness is preferred. All oil-motors are nothing more or less than gas-engines, and come into the same category of the unbalanced. Steam and compressed air motors belong to the other category. This is an essential distinction that inventors should bear in mind. With the gas-engine, the pressure starts at the maximum, and falls. With steam and compressed air, the pressure can be raised gradually, and then fall. This is why steam and compressed air engines run so smoothly. Many years ago, Sir D. Salomons made a large number of experiments in the direction of the employment of a separate vessel in which to explode the gas; the product being afterwards admitted to the cylinder so as to imitate steam-engine conditions. Others have done the same. Though these efforts are not unsuccessful in one sense, it is at the expense of efficiency and weight. Smooth motion in gas-engines may be obtained by counterbalancing the explosion. Engines have been constructed upon this principle, as a rule consisting of two cylinders, in each of which there are two pistons moving away from and towards each other. Complete success can be attained in this way; but only at the cost of great additional complication of valves and valve-gear.

The Utilization of the Gas of Blast Furnaces.

In the course of his presidential address to the Iron and Steel Institute, Mr. Edward P. Martin made some observations upon coking and the recovery of bye-products from blast-furnaces. To this day, it was stated, Abram Darby's plan of coking coal in heaps, introduced by him in 1735, is still carried on at Blaenavon; the coke being used in the production of cold-blast iron. This adherence to an old method would appear to be justifiable only by some exceptional merit, of the existence of which, however, Mr. Martin said nothing. He went on to refer to the experiments that have been carried out with improved coke-ovens of

various designs, with the objects of reducing waste, obtaining coke from different classes of coal, and improving the quality of the product; and he admitted that Continental coke makers had taken the lead, both of this country and the United States, in the matters of making coke from mixed coals, and recovering the bye-products. The saving due to the latter improvement was valued at 2s. per ton. Sulphate of ammonia is being recovered in large quantity from Scotch blast-furnaces, and, under the Mond system, from gas-producers. Reference was made to the utilization of blast-furnace gas as a source of motive power, which has recently made considerable progress both in Scotland and in Belgium. Mr. James Riley has been successful in making this application; and at the Société Cockerill, Mr. Martin has seen an engine that had been working with blast-furnace gas for more than a year. This experiment has been so satisfactory that it has been decided to put down immediately two new engines of 150-horse power each. If it were practicable to apply to this purpose the whole of the gas made by the blast-furnaces at Cockerill's, they would be able to do away with all boilers on the works except those of the locomotives. These furnaces are worked with coke. Upon this head, Mr. Martin remarked: "If blast-furnace gas can be economically applied as the motive power for driving large gas-engines and for generating electric power, it would almost appear as if pig iron will become a bye-product, and the chief work of the ironmaster of the future will be giving light and power to the country." The fact is that the excellence of the ordinary blast-furnace as a gas-producer has not been perceived until recent years, when the arrangements made for the recovery of sulphate of ammonia directed attention to the apparatus from another point of view from that of iron production. If it were worth while, there are many gas-producers worked as such which could be utilized for making or melting pig iron without in any way interfering with their ordinary operations.

German Coke Making.—The production of coke by works associated with the German Coke Syndicate amounted last year to 6,265,338 tons, as compared with 5,562,503 tons in 1895. In 1894 the production was 5,398,612 tons; in 1893, 4,780,489 tons; in 1892, 4,560,984 tons; and in 1891, 4,388,010 tons.

Mr. D. Macfie on the Control of Gas from Meter to Burner.—The lecture delivered on the above-named subject by Mr. D. Macfie, under the auspices of the District Council for Edinburgh and the East of Scotland in connection with the National Registration of Plumbers, and given in the "JOURNAL" for Jan. 19 last (p. 127), has been reprinted in pamphlet form to meet an expressed wish; and the author has forwarded a copy to us. The matter is presented in a convenient shape; and its value has been enhanced by the inclusion of several illustrations.

Prize Essays on Profit-Sharing.—Some time ago, the Comte de Chambrun, the founder of the "Musée Social," the headquarters of which are at 5, Rue Las-Casas, Paris, gave a sum of 25,000 frs. to be distributed in prizes for the best essays that could be obtained on profit-sharing (*participation aux bénéfices*). This international competition, we learn from "The Times," has resulted in 12,000 frs. being awarded to M. Emile Waxwfiler, a Belgian engineer; 8000 frs. to M. Maurice Vaulaer, of Lille; and 5000 frs. to M. Paul Bureau, of Paris. Several other essays are considered worthy of special notice; and two have been judged meritorious enough to be printed at the expense of the Society with those of the three prize-winners. They bear the following mottoes: (1) "*Il n'y a qu'une société de perte et de gain qui puisse reconcilier ceux qui sont destinés à travailler avec ceux qui sont destinés à jouir.*" (Montesquieu.) (2) "*Il ne s'agit pas de faire le monde présent à sa guise, mais de savoir comment il se fait.*"

The Acetylene Explosion at New Haven (Conn.).—Our readers may remember that early last year a fatal explosion of acetylene occurred in the shops of Messrs. F. P. Phlegar and Son, machinists, of New Haven (Conn.). The coroner's inquiry into the circumstances resulted in a verdict that the death of one of the victims (Joseph Hauser) was due to the explosion; and accordingly proceedings were taken by his widow and other parties concerned to recover damages from the above-named firm. The trial commenced in the Superior Court of New Haven on the 10th of March last, before the Hon. John M. Thayer. In view of the importance of the matter, our contemporary "Progressive Age" had a verbatim report of the proceedings taken, and has devoted considerable space to its publication. The result was the award of nominal damages to the amount of $10 to the plaintiffs. It is explained that this low assessment of damages results from a peculiar law of the State which allowed the defendants to "default" the case—*i.e.*, to admit the allegations of the complaint "as to nominal damages only." By adopting this course, the matter is taken from the Jury and goes to the Judge for hearing on the question of damages. Having admitted negligence to a certain degree, the defendants fought the case on the line that they were not negligent at all, or that the deceased was guilty of contributory negligence. The Judge had not filed his decision at the time our contemporary's comments appeared; so that the reasons for his finding were not known. It was thought, however, that his judgment was based on the ground that there was no negligence on the defendants' part, seeing that so little was known about the explosive nature of acetylene at the time they commenced their experiments.

TECHNICAL RECORD.

THE CONFERENCE OF THE INSTITUTION OF CIVIL ENGINEERS.

The success which attended the first annual conference of the Institution of Civil Engineers last week must have satisfied the Council that their broadening policy (of which there have been indications during the last year or two) meets with the approbation of the general body of the members. While the Institution has entered on its roll the names of engineers from all parts of the Empire, it has until lately retained its strictly Metropolitan character in the matter of government and procedure. But the claims of the ever-increasing body of members outside the powerful London section could not continue to be ignored; and the steps which have been taken (of which this conference is one) to bring about a closer union between the London and provincial members will, it is manifest, do much to enhance its influence and usefulness.

The conference was opened on Tuesday morning in the Westminster Town Hall; and so great was the concourse of members that the floor space of the large hall was found insufficient, and the gallery had to be brought into use. Sharp to the appointed time, Mr. J. WOLFE BARRY, C.B., the President of the Institution, mounted the platform, and delivered his

INAUGURAL ADDRESS.

The address was eminently appropriate to the occasion. It began with words of welcome; and if any doubt existed as to the popularity of the progressive action of the Council, it must have been removed by the applause which followed the succeeding remark. The opening of this conference, said the President, "signalizes a new departure in the active life of the Institution—one which is full of promise, and one which, I hope, has been favourably received by our members at large." The President proceeded to give a sketch of the birth and career of the organization, which has now a total roll of 7100, of which 6200 are members, associate members, and associates, and 900 students. Rather more than 5000 are in the United Kingdom, and 2000 abroad. As most of the students and associates are to be found at home, he thought he might say that, of the corporate members carrying on their profession, probably one-half or one-third are in our colonies, dependencies, or foreign countries. Of the 5000 members, associate members, associates, and students in the United Kingdom, nearly 2000 of all classes are living and practising in the Metropolis. These figures, he said, show clearly what extensive support of the Institution comes from abroad and from what are called, for brevity, the provinces. The President next referred to the establishment in connection with the Institution of Associations for students in some of the most important industrial centres—the lead in which direction was taken by Birmingham. These Associations have thriven largely through the great interest taken in their welfare by the older members of the Institution. The closer attachment of students to the Institution has also been promoted by the organization of a series of visits to works in and around London; and these have been the means of bringing the younger and older members of the profession resident in the provinces into closer touch with the Metropolis. He urged that it should be the aim of all members to strengthen the bonds of unity; and, in this connection, he alluded to what was done during the presidency of Sir Benjamin Baker in bringing about local representation on the Council. He ventured to hope that this conference would be the precursor of many gatherings of a similar nature; and he mentioned that they had a list of more than 800 members who had expressed their intention of being present—a large proportion of whom were country members. According to the concluding remarks of the President, it is not intended that the annual congresses shall be peripatetic; but they will continue to be held yearly in London. The Council, it appears, have no desire to interfere with local Associations, or with similar organizations whose annual meetings are moveable.

The subjects which had been put down for discussion were assigned to seven sections; and, at the close of the President's address, the members at once separated to attend the sections in which they were specially interested. The questions discussed on Tuesday possess little interest, from a professional point of view, for our readers. In the division devoted to "Machinery, &c., and Applications of Electricity," the Chairman of which was Sir FREDERICK BRAMWELL, three introductory papers (the writers of which were limited to ten minutes each) were read. They dealt with

THE TRANSMISSION OF POWER BY ELECTRICITY, WATER, AND OTHER AGENTS.

Mr. W. H. PREECE, C.B., contributed the first, treating, of course, of the transmission of power by electricity. It is, he held, the peculiarity and value of electricity as the medium of transmission that the energy wasted on the line can be kept a constant quantity independent of its length; but the cost of up-keep must, of course, increase with its length. He referred to the transformation of water power into electricity, and pointed out that the distance to which it is practical and economical to transport the energy is controlled by the cost of generating it at the given point of application; and this depends upon the

price of fuel at that spot. He quoted instances of "economical and successful" utilization of water power abroad; but in England, he said, we have not many examples. At Foyers, Worcester, Keswick, Windermere, and Lynton, electricity is obtained from water power; but in no case is any great distance covered. At Worcester, the Corporation have established their generating station for lighting the town about 2 miles away on the River Teme—a tributary of the Severn. Here some 250-horse power is procured from a 10-foot fall; and "the advantages obtained through the reduction in generating costs have fully justified the experiment." The cost of generating per unit was under 1½d., although it was necessary to generate 200,000 units out of a total of 333,000 units from coal. The net cost of generating by means of the water was under 0·8d. per unit. He also referred to the proposal to burn coal at the pit mouth, and transport the energy extracted as electric current to London; but, so far as can be seen at present, it is, he said, cheaper to transport the coal. The cost of coal does not form the sole charge in producing electricity; management, labour, repairs, depreciation, and interest on capital expended are much more important items in steam plants. Assuming that it is required to transmit 1000 kilowatts, and that the total annual quantity of energy transmitted is 3,000,000 kilowatt-hours—an amount of electrical energy easily produced from 5000 tons of coal—if the cost of transporting coal 100 miles is 5s. per ton, the annual bill for transport will be £1250. This represents only 0·1d. per unit produced, and is less than the interest on the capital required to be expended on the construction of the line. He remarked, in relation to the supply of power to the inhabitants of a town, to railways and to tramways, and to various separated portions of machinery, that the rivalry of other methods is encountered. The advantages he claimed for electricity are ease and cheapness of distribution, facility in application to nearly every type of machinery, efficiency in generation and in transformation to power, cleanliness and safety, reliability and convenience, he remarked, for repairs. Oil and gas for small powers are more convenient, but not so economical, as steam; while electricity, if it can be (as it is) supplied at 1½d. per kilowatt-hour, is the most convenient and economical, for it is always ready if supplied from a central station. The author concluded by observing that, broadly speaking, it may be said there is no practical difficulty whatever in transmitting energy to great distances by water, oil, coal, gas, air, or electricity. Their relative merits depend first on their relative efficiencies in production and application; but their financial success depends solely on the cost of transport. There are many cases where each must be paramount. There are others where the balance is questionable, and where other conditions—such as space, convenience, cleanliness, safety, and silence—must be considered.

Mr. E. B. Ellington dealt with the transmission of power by water. He claimed that in hydraulic transmission there are present the conditions of a high efficiency—viz., high pressure, low velocities, and constant load. Maximum efficiency is met with in hydraulic hoists for lifting coal-trucks; for here the advantages of non-elasticity and pressure are utilized to their fullest extent, and something like 95 per cent. of the power conveyed is converted into useful work. The efficiency figures for hydraulic transmission are: Loss at the central station, 15 per cent.; loss in transmission, (say) 5 per cent; loss in use, (say) 5 per cent.; net power utilized, 75 per cent. Though no one system of transmission can be pronounced to be absolutely the best under all circumstances, it is clear, said the author, that in such cases of transmission as are required for lifting and pressing, the hydraulic method has many marked advantages. It is also admirably adapted for pumping and working many machine tools direct. Hydraulic power is also a most valuable adjunct to the ordinary water-mains for fire extinction. Nearly 100 miles of hydraulic mains are now available throughout the districts of London where the most valuable property is situated; and at every point on these mains, 500-horse power could be immediately applied to a fire. In this application of hydraulic transmission, the efficiency is low, and the cost per horse power high; but the apparatus is nevertheless as near perfection as can be obtained. Dealing with the question of the basis of charge for hydraulic power, he remarked that the principle of a sliding-scale seems *primâ facie* reasonable. The author exhibited a diagram showing that in London in 1896 nearly 95 per cent. of the quantity of water pumped was accounted for; but a good deal was used for various purposes at the central stations. It also showed that 40 per cent. of the total was taken at 2s. per 1000 gallons and under; and that the average price obtained was 3s.

The third paper was by Dr. John Hopkinson; and it touched upon the broad characteristics of the transmission of power by electricity, water, gearing and shafting, ropes, and compressed air and steam.

The discussion on the papers was of considerable length. It was clearly shown that there could be no general agreement as to the application of any one of the systems to any specific purpose, but that the conditions surrounding each case would govern the engineer's decision as to the system to be adopted. Although there were eminent gas engineers present, gas lacked an advocate; but it was not altogether ignored. It was pointed out by Sir Frederick Bramwell that no mention had been made of the transmission of power by gas, which was in every-day use, and which, so far as he could see, was the cheapest form of all. Among the other speakers, Sir E. H. Carbutt directed attention to what gas companies were doing in providing cheap "power" for cooking purposes. By means of the prepayment meter system (which had become so commercially successful), they gave, he pointed out, sufficient gas for a penny to cook a dinner for twenty persons. Another speaker mentioned that Belfast was discarding gas power for the generation of electricity. In closing the discussion, Sir Frederick Bramwell again took the opportunity of referring to gas. He said that, assuming gas could be obtained at 2s. 9d. per 1000 cubic feet, it was possible to get a brake horse power for a little over ¾d. per hour. Assuming that a Board of Trade unit of electricity was supplied at 4d., it appeared to him possible, after making reasonable allowance, to get a brake horse power for $3\frac{7}{10}$d. Then, assuming that water at 750 lbs. pressure could be distributed at the average price of 3s. per 1000 gallons, it seemed possible to get by this means a brake horse power for 4¼d. Referring to the remarks of Sir E. H. Carbutt, Mr. Preece, in his reply, mentioned that the penny-in-the-slot meter had also been applied to electricity.

In the Water-Works, Sewerage, and Gas-Works Section, the sittings of which were held at the Westminster Guildhall, a paper was read by Mr. James Mansergh on

THE LAW AND ALLOCATION OF UNDERGROUND WATER.

It dealt principally with the interesting contest which has recently been going on before a Parliamentary Committee with reference to the water supply of Newark and Nottingham. The author described the main points at issue between the authorities concerned; and these will be fresh in the minds of interested readers. As to the law bearing on interference with underground waters, Mr. Mansergh said: As I understand it, the Newark people would have no redress if the pumping at Oxton were to lower the water at Farnsfield sufficiently to leave their pumps in the air, and to drain their headings, because they could not prove that there was a defined channel leading the water between the two wells. Their only remedy would be to sink deeper and lower their pumps. Similarly, if the pumping at the existing Nottingham and other wells has had the effect of drying 3½ miles of the Dover Beck, and if further pumping at Oxton and Woodborough will still further shorten the stream and unduly drain the pasture-lands adjoining it, the landowners, so far as I know, cannot for the same reason legally claim any compensation. This would certainly be so under the judgment of the House of Lords in the case of *Chasemore v. Richards*, which was, I believe, the first case in which the question was fully threshed out. There is a case, *Shugar v. Grand Junction Canal Company*, in which the late Lord Hatherley gave a decision which I understand modifies to some extent the ruling in *Chasemore v. Richards*, but to what extent I have never been able to make out. Then there was a quite recent case of *Pickles v. The Corporation of Bradford*, which does not modify the law as determined by *Chasemore v. Richards*. In the reports, the headnote to the case is as follows: "No use of property which would be legal if due to a proper motive can become illegal because it is prompted by a motive which is improper or even malicious. The owner of land containing underground water, which percolates by undefined channels and flows to the land of a neighbour, has the right to divert or appropriate the percolating water within his own land, so as to deprive his neighbour of it (*Chasemore v. Richards*). And his right is just the same whatever his motive may be, whether *bonâ fide* to improve his own land, or maliciously to injure his neighbour, or to induce his neighbour to buy him out." In 1844, I advised on some engineering points which arose on a judgment of one of the Courts in the case of *Ballard v. Tomlinson*, where the water in the plaintiff's well at a brewery was proved to have been fouled by the percolation of foul matter through several hundred yards of chalk from a disused well at an abandoned distillery. One Court decided that the plaintiff had no redress because there were no rights in underground water, and, therefore, no obligation on the part of a person to refrain from turning a disused well into a cesspit, and so injuring a neighbour by spoiling a big brewing of his beer. If this judgment had been upheld, there would have been nothing to prevent a landowner making a boring in a field adjoining one of the Kent Company's wells and pouring in a hogshead of the most virulent poison, and so doing incalculable injury. The judgment was, however, reversed in a higher Court in accordance with the dictates of common sense; but whether according to the strict letter of the law, it is not for a layman to venture an opinion. Again, I was in a case which was considered some years ago by the Police and Sanitary Committee, when Sir Henry Fowler was a member of it, and took a prominent part in the discussion and decision. The Croydon Corporation sought power to sink two wells and drive headings in the chalk—one at Beddington and the other at Addington. The latter was not opposed; but the Beddington one was very strongly by the millowners and riparian owners on the River Wandle, for whom I was acting. A leader of the Parliamentary Bar, relying (I presume) on *Chasemore v. Richards*, assured me before the case came on that we should never get *locus*. We did, however, and satisfied the Committee that the volume of water in the Wandle would be diminished if water were pumped

as proposed. They had also been told that under the law no compensation could be claimed; and, on fully realizing the position, they sanctioned the unopposed well, and struck out the opposed. This, it appears to me, was equivalent to saying that, under the law, an injustice might be done; and they preferred to prevent that injustice by stopping the sinking of the well. Similarly, in the Bristol Water Company's case in 1888, underground water was proposed to be taken; but there was strong opposition from landowners, who would have been legally injured without remedy. The Committee rejected the Bill; and the Company came in the following session with a scheme for impounding surface water, and are now carrying out the works. Again, in this present fight, the Nottingham Corporation have, through their leading Counsel, offered to compensate the landowners if it can be proved that pumping the underground water at Oxton and Woodborough would injure their property by depleting the streams. Under the law, they are not bound to do this; and the offer (if not a mere bid for their Bill) is another admission that the law is at fault. In the case of surface streams, the law is clear, righteous, and intelligible—viz., that a man must allow the water flowing through his property to pass on to his neighbour below unpolluted and practically undiminished in volume, but that he may have the fair and reasonable use of it in its passage through his land. Surely the law, relating to underground water, confessedly so difficult to interpret and obviously likely to operate unjustly, requires some amendment. . . . The result of this protracted fight has been that the Oxton and Woodborough wells have been struck out; and the Nottingham Corporation have only obtained power to make the Boughton well. The Newark Bill has been passed; but the zone of protection is not to extend to the 8-mile circle, but only to the boundary of the present limits of supply. This, however, is an important precedent (if it is confirmed by the other House), and is another case of Parliament protecting people against the injustice of its own laws. It has been estimated that the case has been carried on at the cost of about £800 a day; and although it is not for us to quarrel with our bread and butter, it does seem a little hard on the ratepayers of the smaller communities and on private individuals that they should be compelled to incur this outlay in protecting what they believe to be their rights. Something surely ought to be done to simplify and put upon a sensible basis the allocation of underground water-bearing areas. When we take surface water by means of impounding works, a defined watershed is secured over which no other body can subsequently acquire any rights; and we know exactly where we are. Mr. Balfour Browne, Q.C., in his final speech, said: "The law of underground water as it now stands is simply silly." I am very much inclined to agree with him.

On the resumption of the sitting of the Section dealing with the subjects of Water, Sewerage, and Gas Engineering on Wednesday morning,

Mr. MANSERGH said he was sorry he should have to leave shortly; but Mr. George Livesey had very kindly consented to preside in his stead. He should like to add that they were all very proud of Mr. Livesey. They would all recollect the splendid fight he made in 1888; nothing more magnificent had been done in his (Mr. Mansergh's) experience. Since that strike, Mr. Livesey had also inaugurated changes in the arrangements of the works of his Company which had resulted in the discord which prevailed prior to the strike being replaced by concord and harmonious working, and had set an example which was worthy of imitation all over the country. Mr. Livesey was essentially what they all ought to be, and must be, if they were to be successful. He was one of the best sort of engineers—he engineered his workmen and his Directors, and he (Mr. Mansergh) had heard him engineer very well a Parliamentary Committee. He was also an Engineer who had made his mark in another respect; and one of his marks was very black. On the previous Saturday, he (the speaker) sat in the Blackwall Tunnel under the big mark of the enormous holder at Greenwich, which was 180 feet high; and he asked Mr. Livesey whether he was not ashamed of himself. Unblushingly, he replied that he was not, because that big holder contained 12 million cubic feet of gas. It was a good sound job, and cost £65,000. That, as they all knew, was good and economical engineering; but anything more hideous it was surely impossible for the heart of man to conceive.

Mr. LIVESEY, on taking the chair, said he must say one word. Mr. Mansergh had said a great deal too much in his praise, and had found fault with one of the things of which he was most proud. It was evident that Mr. Mansergh had ceased to be an Engineer, and had now become an art patron; and from that point of view, he (Mr. Livesey) was afraid, the gasholder he had mentioned would not stand criticism.

Mr. CORBET WOODALL (London) then read the following notes upon

CARBURETTED WATER GAS.

The author prefaced his paper by remarking that he had taken very literally the instruction of the Council of the Institution to confine his paper to a limited number of words; and, if the result was that his observations were of a somewhat crude character, he trusted that he might be excused. The one aim he had had in view had been to just outline what was a new departure in gas manufacture, and to lay himself open to any questions that those who were interested in the matter might care to address to him.

Within a period of about ten years, the whole system of illuminating gas supply in the United States was revolutionized by the introduction of carburetted water gas. It was not till 1890 it was first made for distribution in the United Kingdom; the pioneer being The Gaslight and Coke Company, who in that year erected a plant at Beckton to make about a million cubic feet daily. Since then the development of its use has been very rapid. Before the demand for next winter has to be met, apparatus sufficient for the output of about 20 million cubic feet daily will have been erected in London alone; while in Liverpool, Manchester, Birmingham, and some thirty other considerable towns, it will be supplied in greater or less proportion. The quantity of carburetted water gas made will probably reach this year 50 million cubic feet daily, or about 8 per cent. of the maximum output in the United Kingdom for lighting and other purposes. The somewhat remarkable growth of this new phase of the gas industry has attracted but little attention either from the public or the technical press; and these preliminary observations are made in order that its importance may be appreciated.

Water gas is made by passing steam through a deep bed of incandescent coke or anthracite coal. The oxygen of the water combines with the carbon of the fuel; and the result is carbonic oxide and hydrogen gases in nearly equal proportions. Plain water gas so formed is non-luminous; but, when burned, its flame temperature is even greater than that of ordinary coal gas. Because of this high flame temperature, it has found a place in certain manufactures; being used chiefly for welding metals. Efforts have been made to apply it also to lighting purposes. The heat of combustion of the non-luminous flame has been utilized to raise to incandescence a refractory substance, as in the case of the familiar incandescent gas-lamp. These efforts have not been successful. The gas, having only half the calorific value of ordinary coal gas, is proportionately costly to distribute; and the inconvenience attending the use of burners requiring much attention and frequent renewal bars the way to its adoption. Plain water gas is also without odour, and would consequently be highly dangerous if distributed as made. Some substance should always be specially combined with it, the smell of which would make its presence palpable.

Carburetted water gas, as used for lighting purposes, is made by introducing into the water gas in process of manufacture a hydrocarbon oil or distillate in quantity varying with the illuminating value desired. [In order to show the process of manufacture, the author exhibited a diagram, illustrating the form of apparatus now most generally used.] There are many varieties of plant employed; and it is not necessary to discuss here or now their respective advantages. The producer or generator is charged with coke to a working depth of from 5 to 6 feet. This charge is raised to the necessary temperature by an air-blast. The producer gas generated during this process is carried on through the two following vessels, called respectively the carburetter and the superheater. Both these chambers are filled with fire-brick chequerwork, which is heated by the hot gases carried over from the generator. When the bed has been heated to incandescence, the blast of air is shut off, steam is introduced, and passing through the heated carbon is decomposed, as already described. The resultant gas leaving the generator enters the carburetter at the top. The carburetting or enriching oil, which has been previously heated by passing through a spiral pipe placed in the current of the hot gas, is also introduced at the top of the carburetter—entering in a finely-divided spray or vapour. The gases travel together through the carburetter and the superheater or fixer, and are then taken through the condenser, washer, and purifiers as in the case of ordinary coal gas. The temperature of the fuel bed is rapidly reduced by the entering steam, and so also is the chequerwork in the rest of the apparatus. After a run of a few minutes, the steam is shut off, communication with the gas-main is closed, the air-blast is again turned on, and the heat of the apparatus restored. These processes are alternated; gas making being continued for six or seven minutes, and the recuperation for about four. Fuel is fed through the top of the generator hourly; and the furnace is cleaned and clinkered about three times in twenty-four hours.

The cost of carburetted water gas is determined chiefly by the price at which oil can be bought. The sources of supply are the wells of Russia and America, and also, though to a small extent only, the shale-oil works of Scotland. At present suitable oil can be purchased at 2½d. per gallon at English ports, which represents about 2¾d. at the average gas-works. Gas of an illuminating value of 20 candles will require 3 gallons of oil per 1000 cubic feet, and 40 lbs. of coke will also be used in making that quantity. The cost of making gas of 20-candle power with oil at 2¾d. per gallon, and coke at 15s. per ton, will be 1s. 4d. per 1000 cubic feet in the gasholders, which is about the current average cost of making coal gas of 15 candles.

The chief use to which carburetted water gas has been hitherto applied in Great Britain has been for enriching ordinary coal gas. The quality of the gas made from North country coal is not equal to the standard required in many cases by Parliament. Cannel coal, yielding gas of nearly double the illuminating value of ordinary coal, has been used to bring up the average.

The quantity of cannel coal available is reducing; and the price tends to increase. Oil gas in several forms has been substituted for cannel; and of these various forms carburetted water gas is on many grounds the most advantageous. The quality of the gas can be varied at will, and immediately, by regulating the quantity of oil used; and the economy of the process is more apparent as the candle power is raised. For instance, gas of 20 candles is made for 1s. 4d. per 1000 cubic feet; but adding a gallon of oil, the quality is raised to 27 candles, and the cost to 1s. 6¾d. An addition of 35 per cent. of light is thus obtained by an increased expenditure of 17 per cent.

Some incidental advantages attaching to the manufacture of carburetted water gas as compared with coal gas may be named. The cost of the plant for a given output is less. The labour is of a much less exhausting character; and the number of men is reduced by about 70 per cent. The plant is available at its full power within about three hours of lighting up, while coal gas retorts require as many days. A better price will be obtained for the coke, because there will be a less quantity on the market. Gas of a high quality can be burned with much less liability to smoke than heretofore. Against these and other advantages it has been argued that the presence of a high percentage of carbonic oxide makes the gas more than usually dangerous to the user. This objection has been met in America by the fullest inquiry into all reported cases of gas poisoning, with the result that there are now no limitations imposed as to the percentage of carbonic oxide.

The odour of carburetted water gas is pungent; and a proportion of 1 to 8000 makes the atmosphere of a room offensive. Such a proportion is, however, absolutely harmless. It is hardly necessary to say that lighting gas is made to burn, and not to breathe. When leaks occur, they should be discovered and stopped, or whether the gas contains little or much carbonic oxide, it will be injurious and in time fatal. The author knows of no case in which evil results have followed from inhaling carburetted water gas where the consequences would not have been the same with ordinary coal gas.

Discussion.

Mr. H. E. Jones (London) said the author had put at the end of the paper, like a lady's postscript, the part which was of the most general interest, and the part which those who were proposing, as he was himself personally, to use water gas had to consider, and not dismiss too freely—that was the poisonous character of water gas. Until quite recently, in the State of Massachusetts, where water gas was proposed to be extensively used, there was a statute limiting the proportion of carbonic oxide to 10 per cent. This, he believed, had only been removed in later years; but he was bound to say he did not think they must be guided very much by that, because the carelessness or indifference to personal danger in America was very well known, as was evidenced by the fact that they did not guard their railways where they crossed the public thoroughfares. It was all very well to say "this is a sentimental matter, and a man ought not to breathe gas." But what about the people who might be asleep with escaping gas around them? It was his regretful experience to see, while away on a holiday, two men who had gone asleep in a cabin, drawn out stone dead after a few hours. Having been personally at the cabin, he might say that he could not himself distinguish such a strong odour of gas as to make him satisfied that the men were sufficiently warned while asleep.

The Chairman: What gas was it?

Mr. Jones replied that it was a gas that contained a proportion of water gas. The matter might be more or less of a sentimental kind; but it could not be dismissed. They all knew of the sentimental grievance about the purification of gas that was worked up by the scientific authorities. It had become the great bugbear of gas companies, especially in London; but in the Provinces they did not take much notice of it. Apart from this, there was the possible prejudice in the public mind, which might cause them to avoid the use of gas at all. As observed to him only the previous day by a distinguished gas engineer, they could hardly estimate what would be the effect on the public mind if it were alarmed. The chief part of this water gas was for enriching purposes alone. The author of the paper had given them some figures by which he proved that he got much more economy by adding to the oil. For instance, he obtained a further 7 candles of illuminating power by the addition of about 30 per cent. to the oil—by adding 17 per cent. to the cost, he realized 35 per cent. more light. Carrying this a little further, if he used double the oil—if he used 6 gallons—he would get 42-candle gas; and this, worked out, would bring them to a still lower percentage of cost. If they pursued this idea to the *ultima ratio*, they would prove almost conclusively that they had better do without the water gas altogether. He had decided to apply water gas because he could not see his way—and he could not see his way yet—to any other process that would give such rich power for the purpose of raising the illuminating quality of ordinary gas. He had seen no other means equal to this for enrichment; but he had quite satisfied himself that, within the zone of the Thames Companies, there was no possible chance of water gas becoming so economical as to replace ordinary coal gas. He thought Mr. Woodall had rather understated the cost for water gas at 1s. 4d., and a little overstated his comparison—that it was "about the same as the current average cost of making coal gas of 15 candles." He wished the author had given them the *locus in quo* of the 15-candle coal gas.

The Chairman: Mr. Woodall said "the current average cost."

Mr. Jones: I see your net cost in the holder of 16-candle gas was about 10d., although mine was something more than this, because I am not so favourably situated for getting raw material. It was not, however, more than 11d.—that is, the cost of 16-candle gas—as against the 1s. 4d. quoted in the paper for 15-candle gas. Proceeding, Mr. Jones said that as an enricher, it was quite clear that the richer they made the carburetted water gas, the cheaper they got the extra quality; and the less water gas there was in the whole volume, the less carbonic oxide there would be, because there would be less of the water gas and more of the oil gas in it. He should like the author to say what volume of gas he considered could be obtained from a gallon of oil of the usual quality, and also give them some little key as to the specific gravity and flashing-point of the oil, so that they might depend that the oil coming to them would furnish the results claimed by the process.

Mr. Charles Hunt (Birmingham) said Mr. Jones had drawn such a picture of the possible danger of water gas that one was very much surprised that he made up his mind to use it at all. They quite recognized that water gas had a more poisonous quality than coal gas, and that it was more acute in its danger to breathe. But he (Mr. Hunt) was able to say from his own experience that an escape of carburetted water gas was more easily detected than coal gas. He had in his own works detected a comparatively slight smell from the purifiers more than 50 yards distant; and he was certain that, under the same circumstances, he could not have detected coal gas.

The Chairman: But you were not asleep. (Laughter.)

Mr. Hunt (continuing) said, as to the economical advantages of water gas, in his opinion the author had over-stated the actual cost of water gas at the present time—in fact, considerably over-estimated it. Taking Mr. Woodall's own figures, he put the oil at 2¾d. per gallon; so that the cost for oil for 20-candle gas would only be 8¼d. He noticed that he had estimated the coke at 15s. per ton. He (Mr. Hunt) thought they would be very fortunate indeed if they got 15s. per ton all round for coke. He did not know of any gas undertaking in the kingdom that obtained it. It would be fairer to take the lowest value of the coke rather than the highest, for the reason that they withdrew a certain amount of coke from the market, and utilized it for the making of gas. He should be disposed to put the cost of 20-candle gas nearer 1s. than 1s. 4d., with oil at 2¾d. per gallon; and he was certain it could be made for that. Furthermore, Mr. Woodall had estimated a yield of only 20 candles from 3 gallons of oil. His (Mr. Hunt's) own experience was that more than this could be realized. At least 7 candles per gallon per 1000 cubic feet would be considered fair working. Some objection had been made to water gas, and very rightly so, that it was a crude process; and that the greatest value was not obtained from the oil, one could quite admit. With a process by which the heat of the carburetting apparatus could be maintained at a uniform and proper temperature, greater illuminating power could be obtained out of the oil than by this process. He quite admitted that this was so; but the loss was not very material, having regard to the great advantage of being able to produce large volumes of the gas in a short time, especially where the demand for gas was of a fluctuating character. In the ordinary way, the coal-gas retorts could not be put into action in less than 36 to 48 hours; while the water-gas apparatus could be brought into use in (say) 3 hours. In case of fog, they had in this an important auxiliary for augmenting the supply.

Dr. Edward Frankland said he had listened to the paper and the criticisms upon it with very great interest indeed, having been an advocate of water gas for more than forty years. It had seemed to him from the literature on the subject that had been published during this time that water gas laboured under two difficulties. First there was the cost of the gas itself, which had appeared to him to be always in excess of the cost of gas made from common coal. The question of enrichment was an entirely different thing. The second drawback had been the poisonous quality of the gas. He did think (and he quite agreed with Mr. Jones with respect to this) that they must not take America as an example. He thought, however, it would be very unwise to go beyond about 10 per cent. of carbonic oxide in any gas supplied for illuminating purposes. The danger did not exist in the escape of gas during the daytime, when people were awake; but the real danger arose when there was even a comparatively slight escape in a bed-room when people were asleep—not merely from the poisonous character of carbonic oxide, but from the very great difficulties of recovering from its poisonous effects. It was almost impossible, when once a certain stage had been reached (far short of death) to resuscitate a person who had been poisoned by carbonic oxide.

The Chairman: Does it act on the blood?

Dr. Frankland: Yes; the red globules of the blood. The blood remains liquid after it is cooled, and looks like sealing-wax. It has been proposed to kill cattle by carbonic oxide, in order to see the result on the blood. I do not think any risk need be anticipated in the escape of the gas during the day time.

The Chairman: Do you remember the proportion of carbonic oxide in ordinary coal gas?

Dr. FRANKLAND: About 3 or 4 per cent.; and I have known it to be as high as 6 or 7 per cent.

Mr. W. FOULIS (Glasgow) said his observations would be directed to recording his experience, and the conclusions he had come to from practical experience, rather than to go into the matter fully. He quite agreed with the remarks that had been made by Mr. Jones and Dr. Frankland—that they should not venture to introduce anything into the gas supplied to the general public in all sorts of places and to people of all classes of intelligence, which was not as pure as they could possibly make it, and which contained the least deleterious matter. It seemed to him that the only reason they could urge for supplying gas containing a large percentage of carbonic oxide or any other impurity would be that they were able to supply that gas at a substantially lower price to the public than they could ordinary coal gas. The main question they had to consider, as gas engineers, was: "Could we supply this carburetted water gas at a substantially lower price than coal gas?" This was the point they resolved to determine at Glasgow; and for that purpose, they put up a plant capable of making 300,000 cubic feet per day. They had worked the apparatus for nearly two years. He had certainly tested it in every way; and, at all events so far as Glasgow was concerned, he had come to the undoubted conclusion that it was simply impossible for water gas to compete with ordinary coal gas of 20-candle power.

The CHAIRMAN: Can you give us the respective figures?

Mr. FOULIS said unfortunately he had not the figures with him; and he could only speak from memory. His recollection was that their ordinary coal gas cost something like 11d. per 1000 cubic feet—that was, all charges included. The cost of water gas of the same quality—20 candles—was not less than 16d. He was not sure that it was not slightly over.

The CHAIRMAN: You can get cannel cheaper.

Mr. FOULIS said they got a certain kind of cannel comparatively cheap. When making calculations as to the cost of water gas, one always liked to know what was included. He did not think it was fair to take the cost of production, and compare that with the total cost of manufacturing coal gas into the holder. The water gas should be made to bear its proportion of the whole expense; and it would be much more satisfactory if they had (which he had no doubt the author could give them) the actual results as shown in the balance-sheet, of the effect of the introduction of water gas on a considerable scale in any works. There were now some works where water gas was manufactured to the extent of a quarter or a third of the whole quantity of gas made; and the balance-sheets ought to show a substantial reduction or otherwise if the water gas possessed the advantages claimed for it. Without going further into that, he might say, after experimenting for a considerable time, it was perfectly evident to him that the cheapness of water gas for enriching purposes depended upon the quality of the water gas—the higher they got in quality, the more economical it became as an enricher. They went on step by step until they reached nearly 50-candle gas; and it then occurred to him that it would certainly be much more profitable to stop the production of water gas altogether, and simply make oil gas; and for the last two years, he had found that very economical.

The CHAIRMAN: On the Peebles process?

Mr. FOULIS said it was not. The conclusion he had come to was this: Whether rightly or wrongly, he thought, judging from the experience he had had in the manufacture of water gas and oil gas, that the principle of cracking the oils by scrubbing them through a network of hot bricks was certainly not the method which was likely to give the best results from the oil; and if the water gas was to be made very strong, it would be found most profitable to make the oil gas entirely separate in suitable retorts, and mix it with the water gas produced apart from it, so that the heat of the oil could be maintained at an even temperature, because they found, in making oil gas, a variation in temperature of even 20° made a considerable difference in the results obtained. This, he thought, was the direction in which they must look for success in the manufacture of water gas.

Mr. FRANK LIVESEY (London) said he wished to say a few words in support of the concluding remarks made by Mr. Foulis. In the manufacture of water gas, the oil enriching was carried out in this way: The carburetter was heated up; and when it arrived at the proper temperature, the oil was sprayed into it. There was thus a constant decrease in the temperature during the whole of the process. They began with a proper heat, and finished with a heat that was of no value at all. Great care must be exercised in regard to the temperature. Oil gas must be made at an even temperature; or at the latter part of the run they would be destroying the oil. Instead of making gas they would be making tar; and perhaps at the beginning, they were making lamp black. If water gas was to be used, the oil gas should be made separately and mixed with the water gas. As to the question of cost, he had taken out some figures from "Field's Analysis" for 1895 (unfortunately the book for 1896 was not yet published); and it was very evident that certain gas undertakings could not make water gas profitably, when it was considered how cheaply they could get their coal. There was the case of Newcastle, where gas was put into the holder for 9d. per 1000 cubic feet; so that it was very unlikely water gas there could be made cheaper than that. Then at Liverpool it cost 1s. 9d. per 1000 cubic feet for gas in the holder. That was 21-candle gas; and yet he believed Mr. King had admitted that water gas was not more economical. Therefore, it was really a question of the cost of coal and oil. There was also the question as to being able to put a plant to work rapidly. But what he found was this—that in the winter time gas-works were generally working up pretty nearly to their full; and they did not keep the water-gas plant idle, or rather they did not keep it for an emergency. As a rule, all the plant was at work; so that he could not see that water gas possessed any great advantage in a case like that.

Mr. G. C. TREWBY (Gaslight and Coke Company, London) said in reference to what Mr. Livesey had remarked as to the non-advantages of water gas, he should like to say that his Company was responsible for something like from 17 to 20 million cubic feet of this gas; and they were led into it in the first instance by labour troubles. They heard that in America they were in great measure independent of the manufacture of coal gas; and he was therefore sent over by his Company to make inquiries into the subject. He found that in many cases they had a water-gas apparatus in duplicate—that was to say, they could make 2 or 3 million cubic feet of coal gas a day, and nearly the same amount of water gas. Therefore, in case of any labour difficulty, they were able to work the water-gas apparatus, and so be independent of any trouble of this sort. There was some such feeling on the part of his Directors; and they were inclined to do something of the same sort. They put up the apparatus in the first instance as what they called an emergency plant; and it had been used for that purpose, and also for enriching ever since. With respect to the cost of making water gas, he could fully bear out what Mr. Woodall had said, with the exception of the high price he had named for coke. Instead of 15s. per ton, if he had put down the price in London at 9s., it would have been nearer the mark; and that would make a sensible difference in the cost of the carburetted water gas. Then some speaker had expressed doubt as to whether it would be possible to manufacture carburetted water gas at any works in competition with coal gas. At one of his Company's works, they made as much water gas as they possibly could, because actually they manufactured it much cheaper than coal gas.

The CHAIRMAN: Have you machinery in the retort-houses at that works?

Mr. TREWBY said they had not. Where they had machinery, they did not find, when the interest on capital and the wear and tear were taken into consideration, there was a great saving over the ordinary hand labour. He believed Mr. Foulis would bear him out as to the great effect it had had upon the price of cannel. He thought that about twelve months after they had introduced carburetted water gas into their works, one class of cannel had come down as much as 8s. per ton; and that, of course, had been the means of reducing the general cost of gas.

Mr. C. E. JONES remarked that, as an auxiliary to the manufacture of coal gas, he was decidedly in favour of carburetted water gas. With the modesty, however, which characterized the author of the paper, he had not taken all the credit he could possibly look for from carburetted water gas. Labour troubles were an inducement to put down water-gas plant. There was no doubt that combination on the part of coal owners, the labour market, and trade unions, caused considerable anxiety to manufacturers of coal gas; and anything that came to their aid was gladly welcomed. There was another point which might be taken into account in considering the various bearings of water gas—that was the saving of capital. The saving of space necessarily involved a saving of capital expenditure; and when that was worked out, instead of a gas undertaking having an inflated capital, by means of this auxiliary (which water gas should always be, and not take the principal place of coal gas), he thought the capital account would be materially kept down. The danger of carbonic oxide had been spoken of; but it should not be forgotten that coal gas itself was not the healthiest thing in the world to breathe.

Mr. JENKIN pointed out that no one had referred to the use of water gas in connection with gas-engines. He had been told that at Belfast, where water gas was used for enriching coal gas, the effect on the gas-engines was very serious. The heating quality of the gas was, he believed, very different.

Mr. A. M. PADDON (London) said he should like to say with regard to the point that had been last raised that, given equal candle powers, the difference in the heating power of carburetted water gas and coal gas amounted to something like 5 per cent. Another point he should like to refer to was the question raised as to carbonic oxide. There had been some experience in this country which he thought bore very strongly on that. For about two years in the Garston district of the Liverpool Gaslight Company, pure carburetted water gas was distributed; and nearly up to the close of that period, the consumers did not seem to have been aware of the fact. But then their intelligence was stimulated by the local press; and towards the end of the time, they suddenly woke up to the many terrible dangers and vicissitudes to which they were exposed. Two fatal accidents were discovered; and these were put down by the people to carburetted water gas. In one case the gas burning in a bed-room occupied by a lady was accidentally extinguished; and she was found unconscious next day. She, however, lived for about ten days afterwards; and then death was due to shock—the lady being advanced in years. In the other case a labourer and his wife retired to rest after a complaint as

to a smell of gas in the room. There were no fittings there; and the escape was from a service in the wall. The man got up early in the morning. But his wife did not rise until about an hour and a half later; and she then found her husband on the floor. She had breathed the same atmosphere, and suffered no inconvenience whatever; and it was proved at the inquest that her husband's death was due to fatty degeneration of the heart. Mr. Paddon also referred to the statement which was published in the Garston press as to two men dying at Belfast through water-gas poisoning; but as a matter of fact the accident occurred at Drogheda, where water gas was not used. With reference to the incident referred to by Mr. Jones, where two men were killed in an underground place, Mr. Jones was perfectly right in saying that the gas supplied to the district in which these men perished was largely composed of water gas; but it so happened that at the time they died the manufacture of water gas had been discontinued a week before, and was not resumed until a week after—the reason being that the coke was wanted for a contract.

Mr. F. W. Cross (Lea Bridge) said he could fully bear out the figures given in the paper as to the cost of water gas. Since the middle of January last, they had been making water gas at the works with which he was connected; and he was now using 3 gallons of oil per 1000 cubic feet of 20-candle gas and between 40 and 44 lbs. of coke. But instead of 15s. per ton, the coke only cost him 9s. to 10s. 6d. Mr. Frank Livesey had made a remark in regard to the oil being sprayed in the top of the carburetter and cooling the chequerwork. In the practical working of the apparatus, when they first commenced, they ran it intermittently. They started (say) at 6 o'clock in the morning, continuing through the day, and stopping at night. This showed its convenience. On going to the works in the morning, he had noticed on one or two occasions a considerable drop in the quality at the jet photometer, and also with the naked light. He began to make inquiries; and for some time he could not find the reason for this. He went to the works early two or three mornings to investigate the matter; and eventually he discovered that the falling off in the illuminating power was due to the heat in the carburetter and superheater being too low. In the carburetter the temperature was undoubtedly bound to diminish from top to bottom as the oil was sprayed in and fell through the chequerwork; but if the heat was kept at a proper temperature in the superheater (which could be easily done by the man in charge, as he could see the heat through the sight-hole), the oil was cracked up in the carburetter, and vaporized and fixed in the superheater, without any loss.

The Chairman: Can you keep the heat uniform throughout the whole of the running?

Mr. Cross said the heat was kept uniform throughout the whole of the running. There was no appreciable drop in the temperature of the superheater, but there was in the temperature of the carburetter.

Mr. Woodall, in replying to the discussion, said Mr. Jones started the question as to the poisonous character of carbonic oxide; and this seemed to have been the text for a good deal of the discussion. He had said in his opening paper that in Great Britain carburetted water gas had been used so far chiefly for enriching. If one-half of the gas supplied was carburetted water gas, with a percentage of 25 of carbonic oxide, and the other half was only coal gas with a percentage of 7 of carbonic oxide, the average would be about 16 per cent.; and this was certainly not anything to be afraid of. For his own part, he entertained no fear whatever with regard to carbonic oxide, be the percentage what it might. Mr. Jones also referred to what was done years ago in the State of Massachusetts (which was the only one in which there was any care taken at all to regulate the quality of the gas supply, or indeed to exercise any control over the lighting by either gas or electricity). The Massachusetts Gas and Electric Light Commissioners did pass an ordinance that there should be only a limited quantity of carbonic oxide in the gas. But the President of the Board had told him (Mr. Woodall) that, after a most careful and elaborate investigation, they had not localized a single case in which death had resulted from the presence of carbonic oxide in the gas; and they then withdrew the limitation. On his visit to the United States in 1889, he found a number of men who shared the feelings of Mr. Foulis on the question, and who were strongly opposed to changing from ordinary coal gas to water gas. He (the speaker) had, he thought, met the whole of these men since, and not one of them had survived as exclusively a coal gas maker. They had been driven by stress of circumstances, and by the logic of facts, either to give up the use of coal gas entirely or to a very large extent. In the city of Boston, where coal gas continued to hold the field for a longer time than in most other parts of the Eastern States, a petition was presented to the State Legislature, signed by over 200 physicians, who protested against the city being denied the use of a superior gas by reason of this altogether fallacious objection.

The Chairman: Superior with regard to cost?

Mr. Foulis: Was there any reduction in price?

Mr. Woodall said he had no doubt there was. The argument was that it was monstrous to compel people to use a higher quality of gas upon a fallacious argument of this sort. With regard to the question of cost, there were many towns in England where carburetted water gas of 20-candle power could be made at less cost than coal gas of 16-candle power. As he had said in his opening observations, the advantage of the gas was particularly seen when it was used for the purpose of enrichment, because the higher the quality, the smaller the cost per candle. Mr. Jones asked a question with regard to the oil that was used for enriching. He (Mr. Woodall) did not think either the specific gravity or the flashing-point had much to do with the resulting quantity or quality of the gas. He had found that, where an oil with a flashing-point of over 200° had been used, they had got nearly identical results—it was impossible to say what was the difference—to those obtained with a flashing-point of only just over the limit of 73°. He agreed with Mr. Hunt that he had put the price of carburetted water gas rather high. He had done so deliberately, because he did not want to take a case in which, from any special cause, it could be made particularly cheap. But he took as nearly as he could the average cost both for the one and the other. An analysis of the cost had been asked; and he had roughly jotted down how the amount was made up. The oil cost 8¼d.; the coke, 3d.; wages he had put at 1½d.; repair of works, the same; and, adding 1d. for water and supervision, it made 15¼d. He had put down 16d. as a round figure. [Mr. H. E. Jones: There is purification.] Purification would make the difference. If coke cost half the amount he had put down, it would at once reduce the 16d. to 14½d. Mr. Foulis had asked for the results of actual work. In Belfast, the result shown was 12½d.—that was on two years' working for combined coal and water gas, which was, he thought, a reduction of about 3d. per 1000 cubic feet on the price when coal gas only was used. Dr. Frankland had spoken of the difficulty of recovery after poisoning by carbonic oxide. Of course, they all accepted from Dr. Frankland absolutely his statement on such a matter; but he (Mr. Woodall) had seen reports of experiments that pointed to exactly the opposite. After suffocation by coal gas, the recovery was much slower and much more difficult than when the poisoning had been by carbonic oxide in a mixture of gas. Mr. Foulis had long been known among gas engineers as one of the forward men of the profession; and one was amused to find him in a new capacity with regard to carburetted water gas. He spoke of the undesirability of cracking oil in the presence of a large amount of material such as was in the carburetter and superheater of the apparatus; but the one thing that had been demonstrated by years of experience had been the necessity for carrying the gas after making through a large amount of heated surface, for the purpose of fixing it as a permanent gas. There were still a number of processes in use in which the gas was manufactured, as Mr. Foulis and Mr. Frank Livesey desired, in separate vessels, and afterwards mixed with water gas. In all these cases, the apparatus was used (he spoke advisedly) simply because it was there, and the expense of changing it was not faced by those who were using it. These processes were all doomed; and the manufacture of carburetted water gas as set out in his introductory paper was—at any rate according to present knowledge—absolutely assured. With regard to the effect of carburetted water gas on gas-engines, he knew a good number of towns in which a large percentage of carburetted water gas was used with ordinary coal gas; and he had not heard, except on one occasion at Belfast, a single complaint of any effect on gas-engines.

The Chairman said he was sure they were all much indebted to Mr. Woodall for his admirable paper, in which he had condensed so much on this subject. It was not for the Chairman to back up one side or the other. It was his duty to be impartial; and he was not going to depart from that course. Before anything new was introduced, there must be a full justification for it. If there were objections such as those raised by many of the speakers, and particularly by Dr. Frankland, as to the poisonous nature of carbonic oxide, there must be a sufficient justification for a departure from the old system—he meant the old system improved, as Mr. Foulis had done so much to improve it by the introduction of admirable machinery. Whatever Mr. Trewby might say, this machinery did reduce the cost of making gas; and it saved gas companies from the odium of putting men to do—he would not say degrading, but the most arduous and objectionable labour in connection with the work of gas making. No one could say that gas stoking was work that should be performed by men if machinery could be employed to do it better. The justification for the adoption of anything new must be based on its advantages. Some had adopted water gas because, in their circumstances, they could make it cheaper; while others might not adopt it because they could not make it so cheaply as coal gas. Others entered upon the manufacture of water gas some years ago, when cannel was going up enormously in price, in order to checkmate it. That was so with Mr. King, of Liverpool. One of his avowed reasons was to bring the cannel owners to their senses. Another reason that had been put forward for entering on the manufacture of water gas was to enable those having the direction of gas undertakings to resist the tyranny of trade unions. These were indeed good reasons; and where they were applied, each man must use his own judgment as to whether they were sufficient to justify him in adopting the new system.

Mr. J. Emerson Dowson read the next paper, entitled

GAS FOR POWER PURPOSES.

Before reading the paper, the author asked to be allowed to say that he had purposely avoided making special reference to

any particular type of engine or gas plant. He would rather ask his audience to look at the question broadly, and to consider the advantages of the one type of power as compared with another. The paper was as follows :—

Gas-engines driven with ordinary town gas offer the following advantages compared with steam-engines: No ground space for a boiler is required, and no chimney; there is no boiler to clean and repair, and no boiler insurance; there are no clinkers and ashes to remove, and no fireman to pay; the gas-engines can be stopped or started at will, and there is no loss of fuel during the stand-by hours. Besides all this, there is the important fact that there is always a large storage of power to fall back on in the gasholders at the gas-works. For intermittent work, such as hoisting, printing, &c., and for moderate powers working constantly, gas-engines driven by gas taken from the town mains have such manifest advantages that, to a large extent, they have superseded steam-engines, and will doubtless continue to do so. Almost the only drawback to the use of town gas for power purposes is its cost; but in some places the day pressure in the mains is too low, and gives trouble. An engine indicating (say) 20-horse power, worked with gas at 2s. per 1000 cubic feet, and consuming 18 cubic feet per horse power, costs only 0·43d. per indicated horse power. This is considerably less than what is claimed as the lowest cost of power transmitted by water or electricity. It is, however, generally admitted that, when town gas costs more than 3s. per 1000 cubic feet, the working cost of an engine indicating more than about 30-horse power exceeds that of a steam-engine of the same power, under the usual conditions of regular working.

For larger powers, it is now usual to work a gas generating plant in connection with the engine, or there may be several engines served by one gas plant. In such cases the gas plant is to the gas-engine what the boiler is to the steam-engine. Approximately it occupies about the same ground space as a steam-boiler of the same horse power; and the fireman is of the same type in each case. With the gas plant there is no need of a chimney stack; but in towns, or where there are adjoining houses, it is desirable to have a small waste-pipe from the generator carried up above the level of the roofs, so that, when the fire in the generator is blown up after standing, the gases then formed may be blown off without nuisance. The repairs of a gas plant usually cost much less than the cleaning and repairs of a boiler for the same power. The first engine driven with generator gas was in 1879; and since then the adoption of this system of power has spread so rapidly in all countries that it is now impossible to estimate the numbers in use. The general outcome is that engines of good make (indicating 50-horse power and upwards), driven by generator gas of average quality, consume about 1 lb. of fuel, whereas good steam-engines of the same power require not less than 2 to 3 lbs. per indicated horse power hour.

A gas-engine indicating about 120-horse power has been run on test for five hours, with an actual fuel consumption of only ¾ lb. per indicated horse power. On another occasion, with an engine indicating under 33-horse power, the gas plant was placed on a weighing-machine, so as to obtain a series of actual records of the weight of fuel converted into power; and even on this small scale of working, the fuel consumed was only 1·2 lbs. per indicated horse power hour.

It may be accepted that gas-engines of 50 indicated horse power and upwards may be worked, under usual conditions, with 1 lb. of fuel per indicated horse power; but it is right to point out that these results cannot be obtained with all kinds of fuel. For heating furnaces and other such work, generator gas can be made with bituminous coal; but for engine work gas so made carries too much tar and other impurities. To avoid this trouble, the generator gas used for engines is made with anthracite coal or coke. The price of the small anthracite is 6s. to 7s. a ton at the pits in South Wales and near Glasgow, and for the South and West of England, and in most parts of Scotland, the cost of this coal delivered is about the same as that of steam coal. In the Midlands and Northern Counties, it costs more, and then local coke is used.

Lately Dr. Mond has been working a gas plant with bituminous coal; and in his special treatment of the gas, it can be used for engine work. But at present he can only work his process continuously, night and day, in a plant capable of serving not less than 2000 indicated horse power; so that, for ordinary purposes, it is not suitable. It is tolerably certain that sooner or later means will be devised for working engines with gas made from bituminous or semi-bituminous coal; but without waiting for this particular result, the fact remained that great economy is already effected by using anthracite or coke. The Midland Railway, for instance, have an electric light station driven by generator gas power, at Leicester; and although they employ anthracite from South Wales, the actual cost of fuel used for an average of six months, including the light loads in summer and the stand-by hours, is only ⅛d. per unit generated; and such a result could not be obtained with steam power, with the cheapest local coal. In the winter months, the average cost was still lower.

Another important feature of gas is that it does not condense or lose power on its way to the engine. On the contrary, the more the gas is cooled, the better it is for the engine, as each charge of gas which enters the cylinder is more dense, and has consequently greater energy. With steam, the reverse is the case, and there is trouble with leaks in the piping; but with gas there is no such trouble, as the pressure is low. One result of being able to convey gas any distance in pipes, without deterioration, is that there can be a separate engine in each department of a large factory, with light shafting for each. It is no longer necessary to have heavy shafting to drive the whole of a mill or factory from engines placed near the boilers.

The electrical transmission of power in shipyards and other works covering a large area is now being adopted extensively; and in this way some of the loss from condensed steam is avoided. But the power for driving the dynamos still has to be provided; and the most economical is gas power. One of the leading firms on the Clyde is now putting in a large gas plant for this purpose, and another firm is doing the same on the Tees. There are also several instances of gas power being used for electric lighting, as well as for pumping water, pumping sewage, &c.

The stand-by loss of a steam-boiler is considerable, whereas that of a gas-generator, capable of serving 200-horse power, is only from 3 to 5 lbs. per hour. As to the fuel consumption of steam-engines, it is usual to say that non-condensing engines require 2 to 3 lbs. of coal per indicated horse power; but it may be well to remember the words of Sir F. Bramwell in his Presidential Address in 1885 concerning engines working under ordinary practical conditions: "In an investigation instituted last year by the Corporation of Birmingham, when considering whether they should approve of a proposal to lay down power-distributing mains throughout their streets, it was found on indicating some six non-condensing steam-engines taken indiscriminately from among users of power, and ranging from 5 nominal horse power up to 30 nominal horse power, that the consumption in one instance was as high as 27·5 lbs., while it never fell below 9·6 lbs., and the average of the whole was as much as 18 lbs."

Discussion.

Mr. H. E. Jones said he did not propose to discuss the paper; but he wished to quote the figures given by Sir Frederick Bramwell on the previous day in another section. He stated that the cost of transmitting power by gas, when it was not at a higher price than 2s. 9d. per 1000 cubic feet, was ¾d. per brake horse power on the machine worked; by electricity, $3\frac{7}{10}$d.; and by high-pressure water distribution, 4½d.

Dr. E. Frankland asked whether Dowson gas was not substantially water gas.

The Chairman replied that it was not. It was called producer gas. He would ask Mr. Dowson to explain what it was.

Mr. Dowson said it was rather difficult for him to say precisely what producer gas was. It seemed to be almost a trade term. It was a gas made in a generator or producer, either with air or with air and a slight addition of steam; and it was called either producer or generator gas as opposed to what they knew as water gas.

The Chairman: Producer gas, I believe, is mainly composed of carbonic oxide and nitrogen?

Mr. Dowson: The average composition of my generator gas is: Hydrogen, 20 to 25 per cent. by volume; carbonic oxide, 23 to 25 per cent.; marsh gas, 1 to 2 per cent.; carbonic acid, 5 to 6 per cent.; and nitrogen, &c., the difference.

The Chairman: If you use no steam, you get no hydrogen.

Mr. Dowson: Probably not, or very little.

Dr. Frankland said, in making a comparison of the cost, it must be borne in mind that the power obtained from a gas of the composition just given would fall very far short, volume for volume, of that obtained from ordinary coal gas as distributed for lighting purposes.

Mr. Dowson remarked that it took four volumes of generator gas to give the equivalent power of coal gas.

Dr. Frankland asked whether, on this account, if they bought a 10-horse power gas-engine for instance, they would only get from 2½ to 5 horse power out of it. It also struck him that, in comparing ordinary coal gas with producer gas, they must take into consideration the cost of the plant for the latter. Ordinary coal gas contained a large percentage—sometimes nearly 50 per cent.—of marsh gas. This was enormously more effective for power purposes than either producer or water gas, because marsh gas contained in a given volume 12 lbs. of carbon and 4 lbs. of hydrogen, and the whole of these elements—carbon and hydrogen—were unburnt, and had not lost any of their power; whereas with carbonic oxide they had nothing but 12 lbs. of carbon, which had already lost about half its power by being converted into carbonic oxide. Therefore the power locked up in a given volume of marsh gas was considerably greater than that locked up in carbonic oxide or hydrogen.

Mr. Charles Hunt, referring to the working of gas-engines by town gas, said the author had remarked that in some places the day pressure in the mains was too low, and gave trouble. According to his (Mr. Hunt's) experience, this difficulty was largely created by the makers of the gas-engines themselves, who did not appreciate the fact that it was not pressure that was wanted so much as volume. His experience was that from 8-10ths to 9-10ths pressure would be quite sufficient to work a gas-engine, provided the services were of sufficient size. As an instance of the growth of the use of ordinary coal gas for power purposes, they had now in Birmingham more than 1600 gas-engines at work; and at the present time almost every new

extension of power had been by means of gas-engines rather than by steam-engines.

The CHAIRMAN: Your price is only about 2s. 2d., I think?

Mr. HUNT: That would be about the price.

Mr. H. A. HUMPHREY (representing Dr. Mond) remarked that, in reading the portion of the paper in which Mr. Dowson referred to the Mond process, it was as well to bear in mind that Dr. Mond's process was essentially one in which recovery of ammonia took place. Principally for this reason, they had to deal with very large units of plant. Although Mr. Dowson was perfectly right in mentioning that the process was worked in a plant capable of serving 2000 indicated horse power, there was no reason why the unit of plant should not be made much less. Then, again, it was quite possible that, in many works where they had gas-engines requiring producer gas, they would have furnaces at work, so that they could use the recovery process and employ the surplus gas for heating purposes. It might interest those present to know that they had had an engine at work now for nearly two years on producer gas; and it had run for a complete year without any cleaning of the valves or cylinders. A simple cover had been used to keep the dust out of the cylinder. They had recently put down a large engine of 150-horse power; and they found that with 0·9 lb. of bituminous coal in the producer, they could get 1 horse power hour. Recently the Northwich Electric Supply Company had obtained parliamentary powers; and they intended running the central station by means of producer gas. Arrangements had been made to supply them at 2d. per 1000 cubic feet. This was satisfactory to the Company; and it suited the firm to supply the gas.

The CHAIRMAN: Can the gas be produced at 2d. per 1000 cubic feet?

Mr. HUMPHREY replied that he gave full details in the paper which he recently read before the Institution of Civil Engineers.* Taking into account the recovery of the ammonia, the cost per 1000 feet was ¼d. to ⅜d.

Mr. FOULIS asked whether Mr. Dowson had considered the question of obtaining ammonia from the gas. He understood that, in the case of the Mond plant, something like 70 or 80 lbs. of sulphate of ammonia were produced.

Mr. HUMPHREY: 90 lbs. of ammonia per ton of coal.

Mr. FOULIS said they knew that, by applying steam in red-hot anthracite or red-hot coke, a large quantity of ammonia might be obtained; and if this were done, it would practically bring down the cost of working gas-engines.

Mr. DOWSON, in reply, said with regard to what Dr. Frankland had stated as to the loss of power in an engine due to the fact of using a poorer gas, he was happy to tell him that, owing to the generator gas he was speaking of requiring such a small proportion of air for combustion in the same cylinder, they could get in enough of the weaker gas with its proportion of air to develop the same maximum power as with coal gas. The maximum horse power of a gas-engine with generator gas was about one-eighth less than the maximum possible with town gas. Mr. Hunt had remarked, in regard to the use of town gas for gas-engines, that it was a question rather of volume than of pressure. He submitted that there was a limit to that. Of course, they wanted the volume; but they also wanted the pressure, because, with an engine working at a high speed, if there was not a fair pressure behind, the bags got flat.

Mr. HUNT: The question is, what is a fair pressure?

Mr. DOWSON said he had come across a day pressure in town districts as low as 6-10ths; and it was certain an engine would not work well with that. But with 7-10ths or 8-10ths, the engine would work all right. Personally, he had not dealt with the question of the recovery of ammonia. But Mr. Humphrey, acting for Dr. Mond, had tackled this subject; and he did so primarily to recover sulphate of ammonia, and that had led him into the gas question. He (Mr. Dowson) had been accustomed to using anthracite or coke, with which the question of ammonia would not come up so readily as with bituminous coal.

The CHAIRMAN acknowledged, on behalf of those present, their indebtedness to Mr. Dowson for his impartial summary of the question of the use of gas for power purposes.

Other papers followed, among them being two on water-supply questions—one by Dr. Edward Frankland on "The Bacteriology of Water Supply," and the other by Mr. W. Fox on "The Relation between Rainfall, Flow off the Ground, and Actual Yield of Reservoirs." These will be noticed in early issues of the "JOURNAL."

VISITS TO ENGINEERING WORKS.

In connection with the conference, a number of visits were arranged. The programme for Tuesday afternoon included the Old Kent Road works of the South Metropolitan Gas Company, the New River Company's works at Finsbury Park, the Wapping pumping-station of the General Hydraulic Power Company's works, and the Bankside station of the City of London Electric Lighting Company. On Wednesday, the Metropolitan Sewage Disposal works at Barking and the recently opened Blackwall Tunnel were in the list. On Thursday, a goodly number of members accepted the invitation of the Directors of the London Water Companies and Messrs. John Aird and Sons to inspect the river-side works of the Companies. A start was made from Hammersmith Bridge at half-past ten; but before proceeding up the river, the party inspected the four magnificent subsiding reservoirs lately finished for the West Middlesex Company at Barnes Elms. These reservoirs, which cover an area of about 100 acres, receive the water direct from the pumping-station at Hampton. They have a storage capacity of 350 million gallons. It may be remembered that they were specially referred to, in justifiably high terms, by the Chairman at the meeting of the Company on the 18th ult. The party then steamed up to Ditton, where the works of the Chelsea and Lambeth Companies were inspected; the principal object of interest here being the reservoir in course of construction by Messrs. Aird for the former Company. A move was then made to Hampton, where important works are being carried out by the firm for the Grand Junction and Southwark and Vauxhall Companies. The former Company are re-arranging and strengthening their filter-beds so as to bring them quite up to present-day requirements; and the latter are constructing a subsiding reservoir capable of holding 300 million gallons, and an additional filter-bed. Both at Ditton and at Hampton, but especially at the latter place, the massive pumping-engines came in for a large share of attention; those of the Southwark and Vauxhall Company especially eliciting numerous expressions of admiration. Special interest was also taken in the sand-washing process. It was originally intended to go as far as the East London Water Company's works at Sunbury; but time did not allow of this. It only remains to say that the Engineers of the Companies freely answered questions put to them on technical and general matters arising in the course of the inspection of their works; and that an excellent luncheon was provided on the steamers by Messrs. Aird, whose representative (Mr. Basil P. Ellis) supervised the arrangements.

* See "JOURNAL" for March 23, p. 653.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Spring Meeting of the Association was held at Stoke last Thursday, when the President (Mr. John Young) was able, in conjunction with his Board, to arrange a varied programme of great interest, and which was thoroughly enjoyed by the large party of members and the few friends who were present to take part in it. The whole of the expenses attached to the excursion were borne by the Directors of the British Gaslight Company, who were ably represented by the genial President of the Association, who is well known as the Engineer of their Etruria (Potteries) Gas-Works. On the arrival of the party at Stoke—most of whom travelled by the 9.5 train from New Street, Birmingham—they were met by Mr. Young, and proceeded in saloon carriages attached to the 11 o'clock train to Harecastle. Here brakes were in readiness for a drive through some charming country; the first stopping-place being Moreton Old Hall—a sample of 16th century architecture in a fine state of preservation, and until very recently the residence of Miss Elizabeth Moreton. The journey was then continued through Astbury to Congleton, where lunch was served at the Lion and Swan Hotel. In genial weather, the afternoon was taken up with a long drive to Rudyard Lake, and thence by train to Stoke. At 4.30 the members, again by invitation of the Directors of the British Gaslight Company, dined together at the North Stafford Hotel, Stoke; and at the close of the dinner, the thoughtful kindness of the Directors, in conjunction with Mr. Young, was suitably acknowledged by the ex-President (Mr. W. R. Cooper, of Banbury). Mr. Peter Simpson also made a few appreciatory remarks as to Mr. Young's unbounded energy in rendering the day's excursion so enjoyable.

VISIT OF THE SOUTHERN DISTRICT ASSOCIATION TO CROYDON.

The members of the Southern District Association of Gas Engineers and Managers assembled in great force on Thursday last at Croydon for the summer meeting, when they were to have the gratification of seeing their popular President, Mr. James W. Helps, "at home." Contrary to expectation, the day turned out fine, which enabled the long programme to be carried through with the maximum of comfort—no small consideration for those members (and they were not few) who had travelled far to be present on this occasion. Mr. Helps's visitors were expected to make their own arrangements for reaching Croydon; the *rendezvous* being the East Croydon Railway Station, and the hour 10.40. Here the party found brakes in waiting to drive them to the Corporation electric lighting works, kindly opened for inspection by Mr. Alderman Miller, the Chairman of the Electric Lighting Committee. The conditions under which this establishment was started were explained by Mr. Helps in his Inaugural Address to the Association. Here also the Mayor of Croydon was waiting to informally welcome the visitors. The electric lighting works were designed by Dr. A. B. W. Kennedy; and they are on the alternating system. The next stage was to the gas-works at Waddon, where the visitors were welcomed by the Chairman of the Croydon Commercial Gas and Coke Company—Mr. Chas. Hussey, J.P.

Mr. Corbet Woodall, in his capacity of Director of the Company, was also present. A neat pamphlet describing the works, and giving a succinct history of the undertaking had been prepared, and was found most useful in saving questions. It supplied particulars of all the plant in greater detail than can be given here; amply testifying to the modernity of the present management. One thing left unnoticed in this handbook, however, we must single out for praise. This was the admirable little device of coloured and balanced floats invented by Mr. Helps for enabling gas-pressure gauges to be easily read at a distance. Many a much bigger thing has done less to increase safety and comfort in gas-works operations than this ingenious little device. After inspecting the gas-works, a departure was made for the centre of the town, where, at the Greyhound Hotel, luncheon was provided by the Directors of the Company. Upon the invitation of the Mayor, a short visit was paid after luncheon to the handsome Town Hall, whence the brakes started for a drive through the beautiful Addington and Shirley districts to the Crystal Palace. Here an opportunity was afforded of inspecting the Victorian Exhibition; and tea was served. All the arrangements for the day were perfect, and reflect credit upon the Honorary Secretary, Mr. Douglas H. Helps.

RAILWAY CARRIAGE LIGHTING.

The following is a summary of the contents of a paper presented to a German Engineering Society (Der Verein Deutscher Maschinen-Ingenieure) by Herr H. Gerdes, of Berlin. The author endeavoured to set out the claims of oil gas and acetylene as rival illuminants for railway carriages. The full text of his paper has appeared in recent numbers of the "Journal für Gasbeleuchtung."

Oil-gas lighting was extensively introduced in Prussian passenger cars in the seventies. At the present time, 30,145 carriages in Germany are lighted by oil gas; and about 15,401 carriages in England are lighted on the Pintsch plan, and a great number on other oil-gas systems. The cost of oil gas in Germany, including provision for depreciation of plant and interest on capital, is about 11s. 3d. per 1000 cubic feet; but the figure is lower in countries where no import duty on oil is imposed. The consumption is from 0·1 to 0·175 cubic foot per candle-hour with ordinary burners; but it is as low as 0·09 cubic foot per candle-hour with regenerative burners. The latter burners give about 74 candle-hours at a cost of 1d., taking oil gas at 12s. 9d. per 1000 cubic feet. Twenty years' experience of oil gas proves it to be absolutely safe and reliable, and the holders, governors, and other apparatus to be very durable.

Electric lighting for railway carriages has been tried in very many instances; but it has almost invariably been given up in favour of oil gas. Of the English railways, the London, Brighton, and South Coast undoubtedly made the most extensive use of electric lighting; and it is still retained on the carriages to which it was applied. But this is probably only because the Company have a large installation for charging the accumulators; for since 1892 oil gas has been introduced on the system, and there are now 1900 carriages lighted therewith. The Great Northern Railway retain electric lighting on eight trains, for which an electrical company made a very low lighting tender (£64 per train of ten carriages per year) about eight years ago; but the rest of their passenger trains are lighted by oil gas. The results of electric lighting trials on the other English railways have been similar. In the United States of America (excluding electric and street lines), there are only 138 cars now lighted by electricity; whereas there are nearly 8000 lighted on the Pintsch oil-gas system. These figures are surprisingly favourable to oil gas, when it is remembered that in America, more than any other country, electricity has been exploited for all purposes. In Russia, electric lighting has caused three fires within two years among the few cars illuminated thereby; whereas 1382 cars lighted by oil gas have performed their work uninterruptedly for twenty years. Even if the most unfavourable estimates of the cost of oil gas are taken, it will be found to prove a cheaper means of lighting railway carriages than electricity.

The Pennsylvania Railroad uses the Frost system of lighting carriages with air carburetted with gasoline. This dangerous system must eventually give place to oil gas.

Acetylene for railway carriage lighting deserves consideration. Acetylene is obtained from calcium carbide, of which about 6·5 lbs. can be made per 24 hours per horse power. Given water power and cheap coke and lime, a ton of carbide cannot cost less than £7 10s.; while actually the market price at the works now is three to four times as much. Carbide is packed in hermetically-sealed tins, as it eagerly absorbs moisture from the air. The ease with which acetylene is produced, and the beauty of its light, have attracted hosts of unskilled inventors; and there have been many accidents due to the use of unsuitable apparatus in connection with it. The fact that acetylene decomposes or spontaneously explodes at 1436° Fahr., demands that the temperature which may result from bringing carbide in contact with the quantity of water requisite for its complete decomposition, should be ascertained. Though no exact figures can be given, there is no doubt that, with large quantities of carbide, rapid evolution of gas, and insufficient cooling, the temperature in an acetylene generator may easily reach the point at which the acetylene is decomposed. Messrs. Pintsch have avoided this danger by introducing the carbide in small quantities into a large volume of water. Naturally it would seem that the generator might be so constructed that the gas should be given off under a pressure sufficiently great for the direct charging from it of the carriage reservoirs. But such a course would be doubly dangerous, as the heat of compression would be added to the heat of the chemical action, and an explosion of the acetylene would be very easily provoked.

Acetylene forms explosive compounds with copper and its alloys. Messrs. Pintsch, in the summer of 1895, put wooden frames containing samples of various metals and alloys in five steel cylinders, along with 50 c.c. of water. Two cylinders were charged with pure acetylene, two with acetylene mixed with 20 per cent. of oil gas, and one with acetylene mixed with 20 per cent. of coal gas. The cylinders were placed on the roof of a shed, and left exposed to the action of the sun's rays and frost from July 18, 1895, to April 9, 1896. They were then examined; and the original pressure of 10 atmospheres was found not to have been diminished appreciably. Tin plate, nickel, aluminium, Britannia metal, and tin had not been attacked in any way; and lead was scarcely affected. Zinc, copper, and copper alloys—such as brass, bronze, aluminium bronze, &c.—had, however, been strongly acted upon; but in no case could an acetylene compound be detected, nor could an explosion be produced either by heating or shock. Other experiments showed that neither copper nor other metals and alloys were attacked by dry acetylene, but that they were corroded by ammonia gas. These and other researches have proved that copper and its alloys are not attacked by dry acetylene, even in the presence of oxygen; and that therefore no explosive compound can be thus formed. But if the conditions are such that cupreous compounds are formed in the presence of ammonia and acetylene, then the copper-acetylene compound will result.

With regard to the toxic properties of acetylene, it has now been repeatedly shown that they are in no way more pronounced than those of coal gas. The spontaneous decomposition of acetylene at 1436° Fahr. is, however, a more serious objection to its use, since 26 grammes liberate 47·77 calories by their decomposition; and the temperature, calculated on the basis of the specific heats of hydrogen and carbon at high temperatures, would thereby become 5460° Fahr., which would mean an increase of pressure of 12·05 atmospheres per atmosphere initial pressure. This calculation of necessity cannot pretend to a great degree of exactness; but Messrs. Pintsch have endeavoured to ascertain to what extent it is practically corroborated. The soft-soldered reservoirs used on the Prussian railways, when filled with acetylene to 6 atmospheres pressure and heated, first gave way at the joints; and the escaping acetylene burnt quietly. But if a service from such a reservoir were heated to the temperature of dissociation of acetylene, the explosion spread to the contents of the reservoir also. Brazed reservoirs charged to the same pressure were shattered when the temperature of dissociation of acetylene was reached.

It has already been stated (see *ante*, p. 652) that Messrs. Pintsch concluded from their researches that the use of compressed acetylene for railway carriage lighting would be very hazardous, and that they had carried out experiments with mixtures of oil gas and acetylene. The final pressure in the event of the decomposition of the acetylene is greatly modified, because the heat of its decomposition must be partly absorbed in heating the gas mixed with it. Thus, by a similar calculation to that made above for pure acetylene, it would appear that the final temperature produced in a mixture of 70 per cent. oil gas and 30 per cent. acetylene by the decomposition of the latter would be 2425° Fahr., and that 7 atmospheres pressure in a reservoir would thereby be increased to 41 atmospheres only. Practical experiments have shown that reservoirs containing a mixture of oil gas and acetylene in the above-named proportions, are not destroyed by the decomposition of the acetylene. The acetylene in a mixture of oil gas and acetylene in equal proportions is not decomposed until the temperature is considerably higher than that at which pure acetylene decomposes; and moreover the decomposition does not spread from a service to the reservoir. When a reservoir charged to 7 atmospheres with 80 per cent. of oil gas and 20 per cent. of acetylene was placed in a wood fire, it burst when the pressure reached 18 atmospheres—corresponding to a rise in temperature of 630° Fahr. With the railway carriage reservoirs, the joints would in practice give way, and allow the gas to escape, long before this temperature was reached. The explosion of acetylene is not so violent when it is in narrow tubes and uncompressed, as when it is in wide reservoirs and under pressure. Acetylene may be passed under ordinary pressure through a heated glass tube, and carbon separated from the gas; but no explosion will be caused by the heating of the tube. If, however, acetylene in a sealed glass tube be heated similarly, the decomposition is sudden, and is accompanied by a great rise of pressure.

To ascertain the value of acetylene for railway carriage lighting, the illuminating power of mixtures containing it was ascertained for comparison with oil gas. The results are given in the following table. Only the burners commonly employed for carriage lighting were taken; and they were used so that a full-

Photometric Researches on Acetylene and Mixtures containing it.

[The mixtures were made by readings of the manometer, and not by direct measurement in meters; therefore the proportions given are approximate only.]

Gas Used.	Burner.	Gas Pressure in Inches.	Consumption in Cubic Feet per Hour.	Illuminating Power in English Candles.*	Consumption per Candle and Hour in Cubic Feet.	Average Consumption per Candle and Hour in Cubic Feet.	Ratio of Illuminating Power of the Mixture to that of Pure Oil Gas.
Oil gas compressed to 10 atmospheres.	Bray . . . No. 00	1·34	2·60	14·56	0·178	0·309	..
	Bray . . . 000	1·18	1·70	6·04	0·281		
	Bray . . . 0000	1·50	1·38	2·86	0·467		
	Fishtail oil-gas 15	0·83	0·67	1·40	0·476	0·287	..
	Fishtail oil-gas 30	0·55	0·76	2·58	0·295		
	Fishtail oil-gas 40	0·59	1·17	5·88	0·198		
	Fishtail oil-gas 60	0·98	2·12	11·75	0·178		
Mixture of 90 per cent. oil gas and 10 per cent. acetylene.	Bray . . . 00	1·34	2·58	30·43	0·085	0·134	2·09
	Bray . . . 000	1·18	1·72	13·42	0·128		2·22
	Bray . . . 0000	1·10	1·27	6·75	0·183		2·36
	Fishtail oil-gas 15	0·83	0·62	3·16	0·196	0·131	2·25
	Fishtail oil-gas 30	0·51	0·74	5 88	0·126		2·27
	Fishtail oil-gas 40	0·59	1·17	11·05	0·105		1·88
	Fishtail oil-gas 60	0·98	2·19	23·33	0·094		1·98
Mixture of 80 per cent. oil gas and 20 per cent. acetylene.	Bray . . . 00	1·65	2·90	49·29	0·059	0·082	3·38
	Bray . . . 000	1·38	1·91	24·72	0·077		4·92†
	Bray . . . 0000	1·38	1·53	14·03	0·109		4·90
	Fishtail oil-gas 15	0·94	0·74	6 36	0·116	0·083	4·53
	Fishtail oil-gas 30	0·59	0·78	9·21	0·084		3·57
	Fishtail oil-gas 40	0·63	1·18	17·72	0·067		3·01
	Fishtail oil-gas 60	1·30	2·58	39·65	0·065		3·37
Mixture of 70 per cent. oil gas and 30 per cent. acetylene.	Bray . . . 00	2·17	3·25	52 53	0·062	0·074	3·60
	Bray . . . 000	1·73	2·12	30·26	0·071		5 00
	Bray . . . 0000	1·57	1·50	16·92	0 089		5·92
	Fishtail oil-gas 15	0·94	0·67	7·47	0·090	0·075	5·32
	Fishtail oil-gas 30	0·63	0·78	10·17	0·076		3·94
	Fishtail oil-gas 40	0·59	1·18	17·01	0·069		2·89
	Fishtail oil-gas 60	1·30	2·46	37·27	0·066		3·17
Mixture of 60 per cent. oil gas and 40 per cent. acetylene.	Bray . . . 00	2·17	2·96	57·97	0·051	0·058	3·98
	Bray . . . 000	1·73	2·05	35·30	0·048		5·26†
	Bray . . . 0000	1·57	1·59	21·49	0 074		7·51
	Fishtail oil-gas 15	0·94	0·67	9·01	0 075	0 064	6·41
	Fishtail oil-gas 30	0·63	0·76	11·84	0 054		4·59
	Fishtail oil-gas 40	0·59	1·17	19·21	0 060		3·26
	Fishtail oil-gas 60	1·22	2·41	41·66	0 058		3·54
Mixture of 50 per cent. oil gas and 50 per cent. acetylene.	Bray . . . 00	2·17	3·18	60·12	0·053	0·057	4·12
	Bray . . . 000	1·77	2·02	35·30	0 057		5·84
	Bray . . . 0000	1·57	1·50	24 73	0 060		8·65
	Fishtail oil-gas 15	0·98	0·72	9·47	0 076	0·063	6·75
	Fishtail oil-gas 30	0·63	0·81	12·10	0·067		4·69
	Fishtail oil-gas 40	0·63	1·23	21·14	0·059		3·59
	Fishtail oil-gas 60	1·22	2 22	43·41	0·051		3·69
Pure acetylene.	Bray . . . 00	3·35	3·64	146·46	0·025	0·025	10·06
	Bray . . . 000	3·35	2·60	110·50	0·023		18·28
	Bray . . . 0000	3·35	2·02	77·61	0·026		27·14
	Fishtail oil-gas 15	1·14	0·67	20·87	0·032	0·033	14·87
	Fishtail oil-gas 30	0·71	0·76	22·80	0·033		8·84
	Fishtail oil-gas 40	..	..	..	..	..	..
	Fishtail oil-gas 60	..	..	..	..	..	..
Mixture of 70 per cent. coal gas and 30 per cent. acetylene.	Fishtail oil-gas 15	1·97	0·94—0·95	2·38— 2·98	0·320—0·394	0·357	..
	Fishtail oil-gas 30	1·18—1·38	1·14—1·28	5·10— 5·15	0·223—0·249	0·236	..
	Fishtail oil-gas 40	1·18	0·81—0·82	9·50—11·40	0·143—0·173	0·158	..
	Fishtail oil-gas 60	0·98	2·09—2·19	17·10—18·85	0·111—0·128	0·119	..
	Fishtail oil-gas X	0·47	1·11—1·27	10·35	0·108—0·123	0·115	..

* The illuminating power is stated in Hefner units in the original. The generally accepted ratio, 1·14 Hefner unit = 1 English candle, has been used in calculating the values given here. In the lines marked † the want of concordance between the figures is found in the original table, and is not due to errors in the conversion of litres and Hefner units into cubic feet and English candles.—Ed. J. G. L.

sized flame, irrespective of gas pressure, was obtained, though such flame might not be the most favourable to the gas consumption and illuminating power. Perhaps better burners for some of the mixtures could be made; but the oil-gas burners consume the mixtures without stoppages occurring, though no burner seems to be capable of thus uninterruptedly burning pure acetylene.

It will be observed from the table that the greatest improvement in illuminating power is effected by a relatively small addition of acetylene to oil gas. An addition of 20 per cent. of acetylene to oil gas increases the illuminating power threefold; and thereafter a further addition of acetylene does not cause any marked improvement. If very rich oil gas is used, the improvement is not so considerable. Tests showed that a mixture of coal gas and acetylene, containing 30 per cent. of the latter, had about the same illuminating value as oil gas. Such a mixture could be readily produced wherever coal gas was available; but in the matter of cost, it could only compete with oil gas for railway carriage lighting, and not with coal gas for town supplies, for which the incandescent system is available.

A comparison of the cost of lighting by oil gas, and by mixtures of acetylene and oil or coal gas, may be useful. Acetylene, in a state of compression, is taken on the present price of carbide to cost £2 16s. 6d. per 1000 cubic feet; oil gas, 11s. 3d.; and coal gas, 5s. 8d. Then consumed in a No. 40 fishtail oil-gas burner, the cost per candle-hour would be as follows:—

Gas Used.	Cost of One Candle-Hour.
Oil gas	0·024d.
Mixture of 4 parts oil-gas and 1 part acetylene	0·014
„ „ 1 part „ „ 1 „ „	0·021
„ „ 7 parts coal gas and 3 parts „	0·036

The mixing of acetylene with coal gas or oil gas may be effected by coupling together two meters of capacities proportional to the quantities of each gas desired in the mixture. The gases from the two meters are then allowed to mix, and are drawn away by the compressing pumps.

Commercial Benzols.—The "Chemiker Zeitung" recently gave the results of a number of examinations of commercial benzols by Herr S. Forel. A quantity amounting to 100 c.c. of each sample was distilled from a flask of 200 c.c. capacity in 16 to 17 minutes, with the barometer standing at 738 mm. The flask was furnished with a glass delivery-tube of 18 mm. bore, and having the side arm 50 mm. from its lower end. The thermometer passed down this tube so that the whole of the mercury column was surrounded by the vapour of the benzol. The temperature shown under these conditions for water was 99·2° C. Commercially pure benzene boiled at 79·2° C., and pure toluene at 110·2° C. Some 90 per cent. benzol from Belgium distilled between 80° and 119° C., and corresponded to a mixture consisting of benzene, 81; toluene, 15; xylene, 3; and preliminary runnings (chiefly carbon disulphide), 1. English 90's distilled between 79° and 114° C., and corresponded in composition to benzene, 78; toluene, 20; xylene, 1; and preliminary runnings, 1. Silesian 90 per cent. benzol distilled between 82° and 119° C., and corresponded to benzene, 80; toluene, 17; xylene, 2·75; and preliminary runnings, 0·25. Belgian 50 per cent. benzol distilled between 90° and 135° C., and corresponded to a mixture of toluene, 48; benzene, 40; xylene, 11; and cumene, 1. Analogous English products distilled between 88° and 127° C., corresponding to a mixture of toluene, 47; benzene, 46·5; xylene, 6; and preliminary runnings, 0·5.

REGISTER OF PATENTS.

Acetylene Gas Generator.—Jordan, W.; a communication from the Morley Acetylene Gas Company, of Wheeling, W. Va., U.S.A. No. 10,126; May 12, 1896.

This apparatus embodies (1) a generating chamber in which the calcium carbide is located; (2) a source of water supply having its head above the plane of the carbide in the chamber; and (3) a conduit leading from the source of water supply to the chamber, and having outlets within the chamber above the carbide. The water issuing from the conduit is thus caused to first engage the upper portion of the mass of carbide; the pressure of gas then generated operating upon the column of water in the conduit, and so governing the level of it (relatively to the outlet or outlets) as to automatically control the supply of water according to the quantity of gas generated.

In practice, it is preferred to provide the water-conduit with several outlets within the chamber, located in different horizontal planes, and to employ as such outlets branch-pipes extending in different directions and to different distances horizontally, so as to thereby increase the area of diffusion of the water over the carbide. When commencing to generate the gas, the water issues from all the outlets; but as the pressure of the gas increases within the generator, it gradually forces back the column of water in the conduit, below the outlet-openings successively, and thus diminishes the supply of water. When it falls below the lowest outlet, it stops it altogether.

As the gas is consumed, the reduction of the pressure within the generating-chamber permits the column of water within the conduit to rise again to the lowest outlet; and the supply of water from the outlet renews the generation of gas, and continues to do so until the increase of pressure again arrests the flow of water from the outlets. This automatic action goes on so long as the consumption of gas continues.

Manufacturing Carburetted Water Gas.—The Economical Gas Apparatus Construction Company, Limited, of Suffolk House, Cannon Street, E.C., and Merrifield, L. L., of Franklin, Mass., U.S.A. No. 11,530; May 27, 1896.

This apparatus for the manufacture of carburetted water gas consists of a combination of two generators and one superheater and fixing chamber connected with the generators, so that the gases and vapours from the top of either generator can be conducted to the top of the other generator, and after passing down through the fuel therein, are conducted to the superheater—the order of action of the generators being capable of being reversed.

Fig. 1 is a side elevation, fig. 2 a plan, and fig. 3 a section of fig. 2, illustrating the apparatus constructed according to the present invention.

A^1 A^2 represent the two generators; and B B^1, the single superheater and corresponding fixing chamber above it. C is a conduit common to both the generators, and connecting them at their upper part to the superheater B. D^1 D^2 are conduits, which respectively connect the two generators at their lower parts (separately or independently) to the superheater. E is the valve of the upper conduit C; and F^1 F^2 are the valves of the lower conduits D^1 D^2 respectively. The superheater and fixing-chamber B B^1 are filled with refractory material on a beehive arch, so as to obtain equal distribution of heat to the absorbing bricks. G represent the grate-bars of the generators; H are air-blast inlets under the bars; and J J^1 are air-blast inlets to the superheater and fixing-chamber. K K^1 are steam-inlets to the generators at the upper and lower parts respectively. L is the gas-outlet to the fixing-chamber, leading to the washer, and having a dead-weight safety-valve (not shown). A smoke-stack of ordinary construction is also provided. M are the cone-shaped lower parts of the generators; N are the fire-doors; and P the stoke-holes.

Fig. 1.

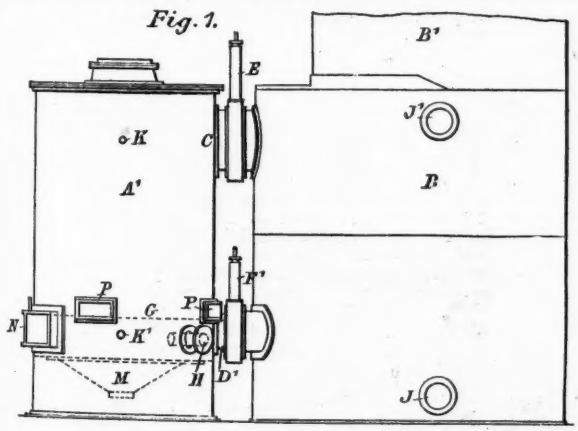


Fig. 2.

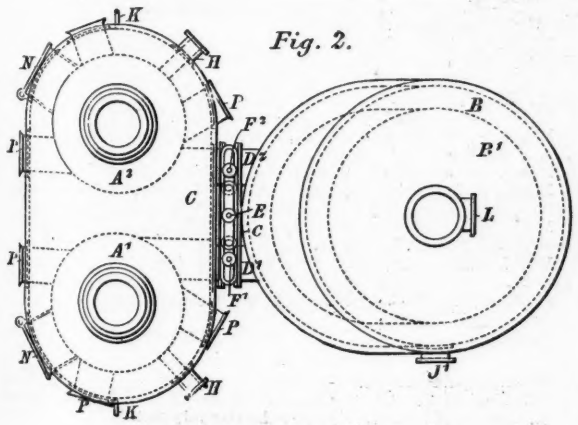
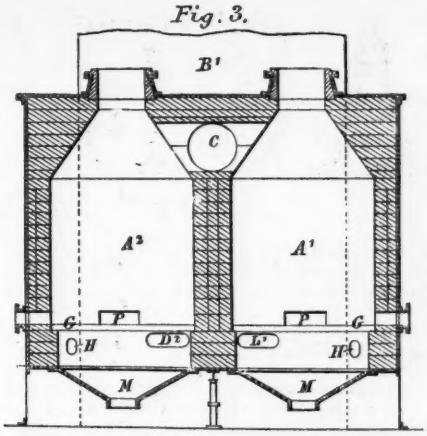


Fig. 3.



The working of the apparatus is as follows: Assuming that the fires have been kindled in both generators A^1 A^2, and the valve to the gas-outlet L of the fixing-chamber B^1 is open, fuel (bituminous coal, anthracite, coke, or charcoal) is introduced through hoppers into the generators up to within from 9 to 18 inches of the upper conduit C. Air is then admitted by the inlets H under the grate-bars G; raising the fuel to incandescence, and converting the air into carbon monoxide. The gas which forms flows through the upper conduit C to the lower part of the superheater B, to which more air is supplied by the inlet J. The combustion gases are thus partially inflamed. The flame and unburnt gas pass up through the checker brickwork of the superheater, where more air is admitted by the inlet J^1, so as to complete the combustion of the inflammable gases. The flame passes on through the upper checker brickwork, which is brought to a state of incandescence; and the products of complete combustion finally escape to the smoke-stack at the top of the superheater and fixing-chamber.

When the fuel in the generators and the brickwork in the superheater and fixing-chamber have been heated to the requisite temperature, the production of gas commences. The air-inlets J J^1 and H should now be closed, and steam admitted at K^1 to one of the generators (say, the generator A^1) and oil to the superheater and fixing-chamber in the usual manner. The conduit between the lower part of one of the generators (say, the conduit D^1 appertaining to the generator A^1) and the superheater should be closed; the conduit D^2 between the generator A^2 and the superheater should be open; and the conduit C between the top of the generators and the superheater and fixing-chamber should be closed—the opening and closing being effected by operating the valves E F^1 F^2. Coal is now supplied to the generators from the top, so as to fall on the hot coke; and steam is admitted to the bottom of the generator A^1 by the inlet K^1. The steam flows up, into, and through the incandescent fuel—being converted into water gas, and carrying with it some water vapour and carbonic acid. When it reaches the top of the layer of coal, it carries forward the gas distilled from the soft coal through the conduit C into the space above the fuel in the generator A^2. Here the gases mix with the gas and vapour from the soft coal previously introduced into the generator A^2—the coal gas and vapour, along with the water gas, flowing down through the fuel in this generator. The water vapour and the carbonic acid resulting from incomplete decomposition in the generator A^1 is converted into hydrogen and carbon monoxide; and the vapours from the coal gas are converted into permanent gas in descending through the incandescent fuel.

The final gases flow from the lower part of the generator A^2, through the conduit D^2, to the lower part of the superheater and fixing-chamber. Here they become fixed and highly superheated; and they are then mixed with hydrocarbon oil sprayed or injected into them. The oil instantly vaporizes, and its vapour is taken up and mixed with the hot water gas, and becomes fixed during its passage through the fixing-chamber; the mixed permanent carburetted water gas escaping by the outlet L at the top of the fixing-chamber to pass to the washer and other complementary apparatus.

From time to time, the order of action of the two generators is reversed; so that A^2 alternately becomes the first generator—the gases therefrom passing to the top of A^1, then down through A^1, and thence by the conduit D^1 to the lower part of the superheater.

If preferred, steam can be admitted to the bottom of both generators at once, by the inlets K^1, so that the two become practically one generator, from which the gases will pass by the upper conduit C to the valve-fitted conduit leading to the lower part of the superheater. Or steam can be admitted to the top of both generators at once by the inlets K; the gases therefrom passing through the lower conduits D^1 D^2 direct to the superheater.

Obtaining Illuminating Gas from Peaty Substances.—Meikle, J., of Glasgow. No. 11,951; June 2, 1896.

It is claimed that this invention is especially useful in treating carbonaceous substances such as, by processes heretofore in use, have yielded gas of little or no illuminating quality. The peat or other carbonaceous substance is gasified in any suitable retort; and there is injected, by means of jets of superheated steam, into the gas while it is being formed or immediately afterwards, a spray of hydrocarbon oil, so as to combine with the gas and form a gaseous mixture having an illuminating value depending on the proportion and quality of the oil injected. Good results are said to be obtained by using steam of about 40 lbs. pressure, superheated to 700° Fahr.; and the oil employed may be of from ·850 to

1·030 specific gravity. The oil-spray may, says the patentee, be injected into the retorts in which the gas is formed, or into a pipe, passage, space, or vessel through which the gas passes on leaving the retort. It is, however, necessary to maintain in the pipe, passage, space, or vessel a heat approximately the same as that in the retorts. No illustration appears in the specification of any suitable arrangement of plant.

Electric Gas-Lighters.—Armstrong, J. T., and Orling, A., of Aldersgate Street, E.C. No. 13,847; June 23, 1896.

This electro-mechanically operated gas-lighting apparatus consists of a circuit making and breaking device operated by turning the valve-plug of the burner, to which is attached an arm that actuates a link provided with a pin adapted to travel in a vertical guide and carry a tension spring, whose other end is attached to a pin beneath it, on the line of centres. The link also carries a contact that co-operates with a stationary insulated contact (connected to a grounded circuit) to produce a spark which, when the break occurs, ignites a gas-jet.

Incandescent Gas Mantles.—Killing, C., of Düsseldorf, Germany. No. 14,365; June 29, 1896.

To manufacture an incandescence mantle giving white light and high luminosity, the patentee proposes a solution of thorium nitrate, consisting of 4 grammes of thorium nitrate in 10 c.c. of water, and with this to mix 8 drops of an iridium chloride solution containing about 0·0033 gramme of iridium in 1 c.c. of water. This mixture is applied in the usual way—impregnating a fabric with it, and burning away the fabric. The mantle will then be found to consist of about 0·6 gramme of oxide of thorium and 0·00034 gramme of iridium.

Lamps for Incandescent Gas-Burners.—Shaw, E. J., of Walsall. No. 18,777; Aug. 25, 1896.

The patentee proposes, when using suspended gas-lamps having incandescent burners, to have a union furnished with one or more washers of dermatine or other similar material, for the purpose of obviating metallic connection of the component parts of union, so as to lessen the vibration due to street traffic, &c. Also he has a special method of securing the globe to the casing of the lamp, by means of a metallic collar fastened to the neck of the globe, and provided with pins engaging with slots in the casing.

Manufacture of Acetylene Gas.—Pereire, G., and Sorel, E., of Paris, and Cruvellier, B., of Marseilles. No. 6997; March 17, 1897. Date claimed under International Convention, Nov. 5, 1896.

This invention relates to the use of steam in the production of acetylene gas from carbide of calcium; the object aimed at being that the reaction is "conducted at a relatively low temperature with perfect regularity, provided that the lime in the form of a dry powder, which is produced by the reaction, is prevented from covering the unattached fragments."

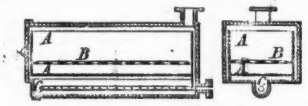


Fig. 1.

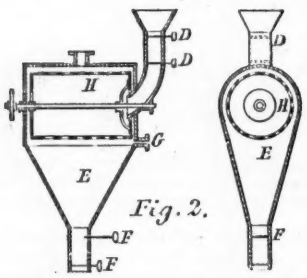


Fig. 2.

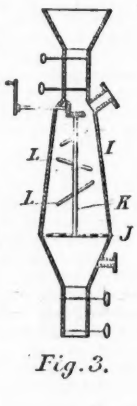


Fig. 3.

These conditions are said to be realized in the apparatus shown in the engraving. First of all, there is a fixed retort—fig. 1. This retort (which is shown horizontal, but may be inclined) contains a metal box A provided with a grating B, upon which a given weight of carbide of calcium is placed. When the retort is closed, steam is led in through the perforated pipe C fixed in a channel in the retort, provided with an outlet for any water condensed. As soon as the reaction commences, the fragments of carbide swell slightly; and the lime powder falls to the bottom of the box, leaving the surface of the carbide free.

As an alternative, a drum-shaped retort—fig. 2—may be used. Here the separation of the lime and the carbide is mechanically produced. The carbide introduced at fixed intervals of time by the means of two doors D, or by a suitable distributor, is projected into the interior of the drum H. It delivers acetylene gas by the action of the steam; and the dry lime powder passes through the sides of the drum and falls into the trunk of the cone E, whence it is withdrawn by the doors F, or other appropriate extractor. Steam passes in by the pipe G.

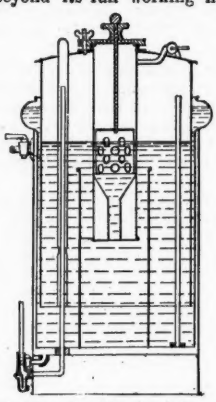
In fig. 3 a vertical retort is shown with a mechanical agitator. A truncated cone I with a vertical axis serves as a retort. It is closed at the bottom with a fine grating J, through which the lime can fall. It is charged and emptied as already described. But, in order to prevent the lime from clogging the interstices of the carbide, a vertical axis provided with an interrupted screw-arm L is put into continuous movement by means of a handle and pinions, which agitates the mass and causes the carbide to fall.

Gas Engines and Motors.—Allsop, R. O., of Norfolk Street, Strand, W.C. No. 26,638; Nov. 24, 1896.

In carrying out his invention, the patentee proposes to employ a piston or plunger to slide into the compression chamber or compression space of gas engines or motors; and thus (by advancing or withdrawing the piston or plunger, and diminishing or increasing the cubical contents of the compression chamber or space) vary the extent to which the explosive mixture of air and gas is compressed in the back-stroke of the motor piston of the cylinder of the engine. The principal claim advanced for this invention is: "In gas and petroleum engines and motors of the 'Otto' four-cycle type, and in gas or petroleum engines or motors of all other types—where a back-stroke of the motor piston compresses (either wholly or in part) the explosive mixture of gas or oil or oil vapour and air—the combination of such engine or motor with an adjustable piston or plunger for varying the cubical contents of the compression, combustion, or explosion chamber, or its equivalent, and for varying the amount of compression of the explosive mixture." When engines and motors of this type are used for factory or other stationary purposes, or for locomotives, tramway-motors, self-propelling road vehicles, and cycles, or for propelling boats or ships, or for any other purposes, the use of such an adjustable plunger or piston sliding into a compression, combustion, or explosion chamber, tends to control and regulate and govern the speed and power developed, and facilitates the starting and prevents the racing of such engines and motors.

Acetylene Generator.—Bean, H. R., of Plaistow, and Ringwood, H., of Poplar, E. No. 5756; March 4, 1897.

This apparatus, as shown, consists of an outer water-vessel, an inner gasholder, a basket or perforated holder for the carbide, and a receptacle for the refuse matter as it falls from the basket. The outer water-vessel is formed with an annular space at the top, to receive the water displaced by the working of the apparatus; while the lower portion has double walls, the inner one of which contains the water. Between the walls is a narrow space forming the upper portion of the condensing chamber. There is also a double bottom, with a space between, which receives the gas as it passes from the head of the holder, down the tube, on its way to the condenser proper. A safety-device is also added, which prevents the gasholder rising beyond its full working height by the following



means: A telescopic pipe, preferably fixed in an opposite direction to the one leading to the condenser, is fastened to, and carried right through, the double bottom, and terminates in a specially formed trap-piece, having an outlet which can be connected to a small pipe, with an open end outside the building. The top end of the outer telescopic pipe is closed within the holder; but an opening is made in the side of it at any point at which it is desired to fix the full working height of the inner vessel or holder. When this height is reached, the gas passes through the opening in the outer pipe, and up until it reaches the inner discharge-pipe. The lowest extremity of this pipe terminates in a trap, which ensures a free passage to the discharge-pipe, but still carries away any water that may collect in the pipes or connections of the safety or relief valve. The charging-chamber is in the centre of the inner vessel or holder, and is fixed to the head of it. It is in direct communication with the holder proper when the charging-cock on the top is opened. The lower end of the chamber is made smaller, and is surrounded by an air chamber or bell affixed to it, which acts as a regulator to the pressure of gas in use.

APPLICATIONS FOR LETTERS PATENT.

12,227.—Swain, E. H., and Smith, G., "Burners or clusters for incandescent gas lighting." May 18.

12,263.—Preston, A., "Manufacture of acetylene gas." May 18.

12,293.—Thompson, W. P., "Gas-burners." A communication from D. Ferrari. May 18.

12,324.—Beaumont, F. J., "Distributing or deflecting light from gas or other lighting agent." May 18.

12,380.—Fletcher, T., Russell, W., and Fletcher, Russell, and Co., Limited, "Hydrocarbon vapour burners." May 19.

12,440.—Fessoirat, E., "Manufacture of incandescence bodies for illuminating purposes." May 19.

12,454.—Silberberg, S., "Prepayment meters." May 20.

12,556.—Quatannens-Moens, R., and Carreér-Dilger, E., "Production of acetylene gas." May 20.

12,559.—Taylor, W. F., "Gas and oil engines." May 21.

12591.—Ennis, T. F., and Green, F. S., "Improvements in the utilization of the refuse obtained from gas-works." May 21.

12,614.—Fellner, S. C., "Charging or discharging rotatable drums, retorts, and the like." May 21.

12,617.—Wellstein, H., "Galleries for incandescent mantles." May 21.

12,619.—Jousset, C., and Ward, H. N., "Generation and burning of acetylene gas." May 21.

12,657.—Parkinson, W. C., "Prepayment gas-meters." May 22.

Danbury Water Supply.—The Local Government Board have granted the Chelmsford Rural District Council power to borrow £5500 for extending works of water supply in the Danbury district.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Colne Corporation Bill, East Warwickshire Water Bill, Llandudno Urban District Council Bill, Nottingham Corporation Water Bill, St. Neot's Water Bill, Swadlincote District Gas Bill.

Bills read a second time: Clackmannan (Alloa and Tillicoultry) Water Supply Provisional Order Bill, Gas Orders Confirmation Bill (No. 2).

Bills reported: Dublin Corporation Bill, Leeds Corporation Bill, Stirling Burgh Gas Bill [Bill rejected], Swansea Improvements and Tramways Bill.

Bills read the third time and passed: Ashford Urban District Council Bill, Arundel Gas Bill, Clackmannan (Alloa and Tillicoultry) Provisional Order Bill, Deal and Walmer Water Bill, Devonport Water Bill, Weymouth Gas Bill.

HOUSE OF COMMONS.

Monday, May 24.

METROPOLITAN WATER COMPANIES BILL.

Mr. CHAPLIN, in asking leave to introduce a Bill to amend the law respecting the Metropolitan Water Companies, explained that it was brought forward in fulfilment of an undertaking he gave earlier in the session. As the House was aware, the chief subject of controversy which surrounded the question of the London Water Supply had already been referred to a Royal Commission. Pending the result of their inquiry, it had been urged upon them—and the Government were of this opinion themselves—that something might be done with advantage to strengthen the position of the water consumer in the Metropolis, who was often placed at a great disadvantage when he found himself in conflict with the Water Companies. At present, when he found himself aggrieved, his course was to go to the Magistrates in some cases and to the Local Government Board in others. In applying to the Board, he must be supported by twenty resident householders; and sometimes, owing to technical objections, their applications were found to be invalid. The present means of redress entailed upon each individual consumer great trouble, and very often expenses they were quite unwilling to pay. This being so, what the Government proposed was not to alter, but add to the existing law. They purposed doing it in this way: They left to the water consumers all the rights and remedies they at present possessed; they created an additional tribunal before which their complaints could be made; and they called in the local authorities to aid and assist them. At present, the complaints had to be initiated by the consumer. Under the Bill, however, the local authorities would also be empowered to take the initiative; and the tribunal which was to hear their complaints would be the Railway and Canal Commission. The Government had chosen this tribunal for two reasons—first of all, because it was not too much over-burdened with work at the present time; and, secondly, because it seemed to be very undesirable to create an entirely new tribunal for the purpose of giving effect to what must, after all, be only a temporary measure until the Royal Commission had reported. The Bill was a very short one; it was also a simple and a modest measure. The new powers and duties, however, which they were conferring on the local authorities must not be underrated. They were very considerable; and he hoped the proposal would be found an adequate fulfilment of the undertaking he gave earlier in the session.

Sir J. PEASE remarked that last year the Committee over which he had the honour to preside passed unanimously a report calling the attention of the House to the state of affairs which existed at present, than which, perhaps, nothing could be worse for so densely crowded a population as that of London. He was afraid the Bill which his right hon. friend proposed to introduce was no remedy; and that palliatives of this character would only add to the evils already existing. The local authorities were not placed in a position to deal with the Water Companies. He thought the House must face before very long the great difficulties which arose from the present position of affairs. If this great city, which was so constantly increasing in population, was to be kept thoroughly well supplied with water, there must be some principle laid down for handing the supply to the local authority or giving to the Water Companies, under the charge of Parliament, not merely regulations as to disputes, but general regulations which ought to apply to all the Companies on a more extensive scale than was now proposed.

Leave was then given to introduce the Bill, which was subsequently brought in by Mr. Chaplin, Mr. Chamberlain, Mr. Ritchie, and Mr. T. W. Russell, read the first time, and ordered for second reading.*

The following further progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Deal and Walmer Water Bill, Fylde Water (Transfer) Bill, New Hunstanton Water and Gas Bill.

Bills reported: Local Government Provisional Order (Gas) Bill Lowestoft Water and Gas Bill.

Bills read the third time and passed; Cowes Gas Bill, East Warwickshire Water Bill, Llandudno Urban District Council Bill, Nottingham Corporation Water Bill, St. Neot's Water Bill, Swadlincote District Gas Bill.

A Bill to amend the Employers' Liability Act, 1880, was brought in last Wednesday by Mr. Butcher, Sir E. Clarke, Sir W. Houldsworth, and Mr. Ascroft, and read the first time; and on the following day another Bill, having a similar object, was introduced by Mr. Provand, Mr. Lowles, Mr. Martin, Mr. Strauss, Mr. D. Thomas, Mr. Ascroft, Mr. Hogan, and Mr. Holland, and read the first time.

* The Bill was issued last Friday; and its provisions will be found in our "Miscellaneous News."

LEGAL INTELLIGENCE.

The Incandescent Gas-Light Company's Patents.

In the Chancery Division of the High Court of Justice last Saturday, Mr. Justice Romer had before him the case of *The Incandescent Gas-Light Company, Limited, v. Boehm*, which came on as a short cause upon motion for judgment in default of defence. Mr. Gray, for the plaintiffs, asked for an injunction restraining the defendant, who carries on business at 61, Wiesbaden Road, Stoke Newington, from infringing their patents of 1885 and 1886. His Lordship granted the injunction, and certified that the particulars of breaches were proper. He also ordered the defendant to pay the costs. Later in the day, the defendant appeared in person, and asked that the case might be tried before a jury. His Lordship pointed out that the defendant was in this difficulty—that, though a statement of claim had been delivered, he had failed to put in a defence; and judgment had now been pronounced in default. The defendant said he had not the means to employ a solicitor. He believed he might be able to obtain money from a friend if the case could be tried before a jury. His Lordship said he was unable to assist the defendant. If he had any case for a stay of proceedings, he could apply. He (Justice Romer) should advise him to consult a solicitor; but if he had not the means, he could apply to the Official Solicitor. Defendant thanked his Lordship for the advice, and said he would act upon it. An order restraining infringement of the same patents was also made against Mr. Marsden, of 29, Fore Street, London.

The Charge of Embezzlement Against a Gas Company's Collector.

At the Westminster Police Court last Tuesday, Mr. Marsham was occupied for some hours in investigating the charges of larceny and embezzlement preferred by The Gaslight and Coke Company against Frederick William Jones, formerly collector in their service for the Hoxton district, and late paid Secretary of the Company's Workmen's Outdoor Provident Fund (see *ante*, p. 1145). Mr. C. O. Humphreys prosecuted; Mr. Tonkin appeared for the accused, who it was alleged absconded in October last. Evidence had previously been given as to extensive deficiencies in the accounts; and the present examination was directed to proving a charge of misappropriating the sum of £645 2s. 9d., the moneys of the Workmen's Provident Fund. Mr. G. F. L. Foulger, the Company's Chief Distributing Engineer and Honorary Treasurer of the fund, said prisoner had been the paid Secretary for many years, at a salary of £50 per annum. In October last, after an audit at which the deficiency was found to be between £700 and £800, the prisoner at an interview said he was not at that moment in a position to pay the money, but he thought he could shortly get it together. Witness told him, in answer to his question whether he would probably lose his situation, that it was a matter for the Directors; and that the first step in his favour would be to get as much money together as he could. In cross-examination, Mr. Foulger said the prisoner did not deny, but rather admitted, that he was responsible for the deficiency. Mr. Marsham bound over the witnesses to attend at the sessions.

Tipton Gas Supply.—At the meeting of the Tipton District Council last Tuesday, the Gas Committee reported that the gross profit on the gas undertaking for the past financial year was £5473. After repaying principal and defraying charges for interest, there was a net profit of £1211. The consumption of gas was 80,801,400 cubic feet—an increase of 5,723,603 cubic feet.

The Gas Workers' Dispute at Rotherham.—Mr. C. E. Rhodes, the General Manager of the collieries of Messrs. John Brown and Co., Limited, who has acted as Arbitrator in the dispute between the Rotherham Gas Committee and their men, has submitted his award. It may be remembered that some time ago difficulties arose through the stokers applying for the abolition of coal wheeling in connection with their work. Prolonged negotiations between the men and a Sub-Committee of the Gas Committee followed; and it was decided that the stokers should be placed in a position that would leave them no worse off than the stokers of the Sheffield Gas Company. Statistics and other information were obtained from Sheffield; but the parties failed to agree, and Mr. Rhodes kindly consented to act as Arbitrator. His decision is favourable to the men; the extra amount of payment per man per shift being fixed at 3½d. A meeting of the men was held last Wednesday to receive the award; and a vote of thanks was passed to Mr. Rhodes for his services.

The Price of Gas at Malvern.—At a special meeting of the Malvern Urban District Council on the 21st ult., Mr. J. M. Evans, in accordance with notice, moved that the price of gas should be reduced from 3s. 4d. to 3s. per 1000 cubic feet. He argued that there was every prospect of the consumption of gas going up; and it was generally recognized that the greater the manufacture the less the cost of production. The profit on the gas-works last year was £1450; and he considered the request for a reduction of 4d. modest, and well within what the profit warranted. Such a reduction would absorb £600 odd; but, having regard to the anticipated increase of consumption, he thought they might with confidence expect the total amount realized next year to be as large as that of last year. Mr. W. Davis seconded the motion. The Chairman of the Gas Committee (Mr. Nevile), who was in Scotland, in a letter sent to the Council, gave credit to the Manager (Mr. H. P. Maybury) for the satisfactory profits at the disposal of the Council. He suggested that the price should be left where it is for the current year, and a Committee appointed to consider the question. He thought, if the price of gas was to be varied, it should be done on a fixed basis, and not by a hap-hazard vote from time to time. Dr. Grindrod said the motion did not go far enough; and he moved an amendment that gas should be sold to ratepayers at the actual cost of production, *plus* 10 per cent. for contingencies. This proposition, however, did not find a seconder. Colonel Twynam moved a further amendment, embodying Mr. Nevile's suggestion, to appoint a Committee, and ask them to report to the Council before next year's estimates were presented. This was agreed to.

MISCELLANEOUS NEWS.

BIRMINGHAM CORPORATION GAS SUPPLY.

Annual Report.

At the Meeting of the Birmingham City Council to-day, the Gas Committee will present their annual report. It refers in the first place to the extensions of the manufacturing plant now in progress, and mentions that the following tenders have been accepted: Messrs. C. & W. Walker, purifiers, carburetted water-gas plant, Saltley, £4888; R. & J. Dempster, ditto, Windsor Street, £3273; R. & J. Dempster, coal hoppers, Windsor Street, £1120; John Aird and Sons, gasholder tank, Saltley, £25,380; and Babcock and Wilcox, boiler, Saltley, £400. Owing to the largely-increased demand for gas in the area supplied from the Swan Village works, the Committee have transferred a portion of the area on the west of Birmingham so supplied to the Birmingham works, and have authorized an expenditure of £3889 for the enlargement of the carrier mains in Wednesbury and Edgbaston, and in the provision of a new governor in connection therewith. The Committee announce that, at the request of the fitters employed in the fittings department, the holidays granted to them have been rearranged, so as to provide that the workmen in the continuous employment of the department shall obtain six days' holiday in the year, and an increase has been made in the wages of the junior fitters who are taken into the employment of the department on the expiration of their apprenticeship. The attention of the Committee has been directed by the Board of Inland Revenue to the duty imposed on registrars of transfers of stock of satisfying themselves that transfers bearing the fixed duty of 10s. are not liable to *ad valorem* duty. They have, in conference with the Finance Committee, given instructions that in all cases where the required information is not given with such transfers of the nature of the transfer, the necessary inquiries shall be made before registration.

The Committee submit the balance-sheet and statement of accounts for the year ended March 31, showing a profit amounting to £35,250. They recommend that the balance of profit shall be appropriated as follows: £30,000 to the improvement rate of 1896, and £5250 to the improvement rate of 1897 on account of the amount estimated to be available for this purpose in the current year. If this recommendation is approved, the contributions to public purposes from the funds of the gas undertaking in the year ended March last will be as follows: In aid of improvement rate of 1896 from profits, £30,000; in aid of improvement rate of 1896, interest on reserve fund, £4000; in aid of public lighting within the city, £11,783; in aid of lighting of courts within the city, £2391; in aid of Museum and School of Art Committee, reconstruction of roof lights, £750; in aid of improvement rate of 1897, £5250; in aid of public and court lighting outside the city, £3560—or a total of £57,734. The Committee have informed the Finance Committee that they estimate that the sum available from the funds of the department in the current year in aid of the improvement rate of 1897 will be £25,000, in addition to the interest on the reserve fund. The accounts show a total expenditure for the year on revenue account of £506,475, of which £428,785 was for coal and manufacturing expenses, £38,153 expenses of distribution, £3020 lighting and repairing public lamps; £25,087 rent, rates, and taxes; and £10,135 management. The receipts of the department were £640,601; and the gross balance to profit and loss account was £134,125.

WEST BROMWICH CORPORATION GAS SUPPLY.

The Annual Report and Accounts.

The annual report and accounts of the West Bromwich Corporation Gas Department have lately been issued by the Secretary (Mr. T. Hudson). The report states that, in consequence of the increased production of gas during the year, the capital expenditure per ton of coal carbonized was reduced from £9 8s. 2d. per ton to £8 16s. 10d. The actual capital employed on March 31 was £8 3s. 5d per ton. The last returns of the Board of Trade showed that the average capital per ton of coal carbonized in the case of gas undertakings belonging to local authorities was £5 16s. 3d.; and the average of all the gas-works throughout the kingdom was £5 18s. 7d. Therefore, it was highly desirable that extensions of works, plant, &c., contemplated should be executed without increasing the capital burden of the undertaking. The income from the sale of gas again exhibited a satisfactory increase—amounting to £1933. There was also an increase of 8·32 per cent. in the quantity of gas sold, which proved when compared with the increased percentage of income, that the principal advance had taken place in the larger or lower-priced consumers, embracing manufactories and workshops. For example, consumers at 2s. 8d. per 1000 cubic feet had used 3·82 per cent. more gas than in the previous year; those at 2s. 6d., 11·14 per cent.; those at 2s. 4d., 4·30 per cent.; and those at 2s. 3d., 36·85 per cent. The number of houses in the borough in November, 1896, was 12,691, of which number 4940 were supplied with gas through ordinary meters, while 782 had their supply by means of automatic prepayment meters. The total number of consumers of all kinds at the end of the financial year was 6007, against 5217 in the previous twelve months; the increase being entirely due to the adoption of prepayment meters in private houses. The total quantity of gas consumed (exclusive of public lighting) was 215,957,875 cubic feet. The introduction of the prepayment meter system had been successful; 1300 applications having been received down to date of the report. The income from coke was £6511, including £1463, the value of the coke used as fuel on the works. The total income from all sources was £38,951, against £37,223 in the previous year—an increase of £1728. The total expenditure on the trading account was £27,634, compared with £27,425 in the previous year—an increase of £209. The manufacturing charges were £19,255—a rise of £276; the cost of coal being £11,813, or £603 more than before, due to the greater quantity carbonized. The introduction of mechanical stoking resulted in a reduction of 3½d. per ton in the carbonizing wages. The net cost of coal, after deducting the income from residual products, was £3526, which was not so favourable as in past years. The quantity of coal and cannel carbonized was 22,558 tons, or 1336 tons more than in 1895-6. The cost of distribution, including repairs and maintenance, was £1896—an amount in excess of previous years. During the year, 10,965,325 cubic feet of gas, equivalent to 4 48 per cent., was lost by leakage and condensation. The gross profit was £11,316, as compared with £9798 in the previous year—an increase of £1518. The balance of undivided profit standing to the credit of the profit and loss account at the commencement of the year was £11,356; and after £1000 had been transferred to the relief of the general district rate, a sum of £10,356 was left as working capital. There remained a surplus for the year of £2834, compared with £1373 for the year 1895-6; and Mr. Hudson recommends the Committee to transfer £1500 in relief of the rates, and to place to the credit of the depreciation fund £1300 of the balance. This would leave a balance of £10,391 for working capital.

STAFFORD CORPORATION GAS AND ELECTRICITY SUPPLY.

Annual Report and Accounts—Proposed Introduction of Profit-Sharing.

As briefly mentioned in the "JOURNAL" last week, the Chairman of the Gas and Electricity Committee of the Stafford Corporation (Alderman W. H. Peach, J.P.) presented the annual report of the Committee, with the accounts of the departments, for the year ending March 31, at the meeting of the Town Council on the 18th ult. Both documents contain matters of interest which justify more extended reference to them than we were able to make in our last issue.

Dealing first with the report, it states that the quantity of gas produced during the above-named period was 143,503,000 cubic feet, or 1,747,000 feet less than the previous year. But it is satisfactory to note that there was an increase of 996,100 cubic feet in the quantity sold, owing to the leakage, mainly caused by sewerage operations, having been materially decreased. The receipts for gas were £17,343—an increase of £100; 6490 tons of coke were sold, or an increase of 266 tons, resulting from a more extended use of the new furnaces. Owing, however, to the lower prices ruling, the receipts were only about £31 more; the total being £2286. Sulphate of ammonia yielded £564—an increase of £46. Having made a very favourable contract for the sale of surplus tar for two years, this product yielded £1085, or £145 more than before. The net amount received for residuals was £3963, against £3745. The profit on gas-fittings was £71 8s. 1d. The total receipts were £21,378. Including £1037, set aside for depreciation, the total expenditure was £13,580; leaving a gross profit of £7798. Interest on, and repayment of loans and income-tax absorbed £5639; leaving as net profit for the year the very satisfactory sum of £2159—an increase of more than 50 per cent. on the previous year. Including £92 brought forward from last year, there is a balance of £2251 available for disposal. The Committee recommended that £2250 should be transferred to the district fund in aid of the rates—being the largest sum ever voted for this purpose; and they further advised that the reserve fund should be considerably strengthened next year, as this is practically the only capital the Gas Department possess. In regard to the Electricity Department, the report states that this has been very successful indeed for a new undertaking. There were 48,168 units of electricity sold during the year; yielding a revenue of £1215—an increase of £756. The expenditure was £614; leaving a gross profit of £601. Adding the £296 standing over, there was a balance of £897, which has been carried forward. The Committee will not therefore require any assistance from the Finance Committee to enable them to meet their obligations on loan account for the present year. The price of current has been brought down to 7d. per unit, with a further reduction to 3d. after the maximum demand has been exceeded (which is now an average of one hour per day); and a sliding-scale as low as 5d. per unit has been adopted where 8000 units per annum are consumed. The Committee therefore look forward to a greater consumption of current during the present year. The Committee conclude by paying a high tribute to the Engineer (Mr. J. Ferguson Bell, Assoc.M.Inst.C.E.), to whose energy and ability they say they principally owe their present prosperous condition; and they suggest it will not be creditable to allow his services to go any longer unrecognized and unrewarded.

Appended to the accounts of the Gas Department is an analysis prepared by Mr. Bell, which shows that the capital employed is at the rate of £4 14s. 11d. per ton of coal carbonized, and 11s. 3·47d. per 1000 cubic feet of gas sold. The working result on the latter basis is as follows: Coals, less residuals, 4·4d.; manufacture, 7·12d.; distribution, 1·23d.; rates and taxes, 1 53d.; management, 0·60d.; bad debts, 0·15d.; workmen's insurance, 0·06d.—total, 15·09d. The net profit is 3·96d., made up with the balance brought forward (0·16d.) to 4·12d. per 1000 cubic feet. This amount of 15·09d. for everything is exceedingly good working.

Alderman PEACH, in moving the consideration of the report, said that the gas sold during the past year amounted in value to £17,343, against £17,242 in the previous year, or about £100 more. The residuals realized £3963 net, against £3745—an increase of £218. Residuals returned 62½ per cent. on the cost of the coal carbonized during the year. The increase was made up as follows: Coke, £2286, against £2254, or £32 more; tar, £1085, against £940, or £145 more; and sulphate of ammonia, £564, against £517, or £47 more. Sulphate of ammonia still kept very low in price; and the Committee had decided to join the Sulphate of Ammonia Manufacturers' Association, which had been formed to bring the value of the product prominently before agriculturists. It seemed a pity that farmers should pay more for nitrate of soda than the price for which they could purchase sulphate of ammonia, especially bearing in mind that nitrate only contained 18 per cent. of ammonia, compared with 24 per cent. in sulphate. Further, nitrate was imported, and sulphate was a home manufacture, which should be an additional reason to purchase sulphate. Sulphate used to sell at £22 per ton; now it was £7 or £8. Yet people asked why the gas-works profits were not always the same. The difference between £22 and £8 per ton made a reduction in their profits of no less than £1800 per annum; and if sulphate could be maintained at £12 per ton, which appeared a reasonable price, it would increase them by about £700 per annum. Having dealt with other items in the accounts, he said that, taking the gross receipts, £21,378, and the total expenses, they had £7798 as gross profit, which was the largest amount the Committee had ever had to report. After paying £5638 for

interest and repayment of loans and income-tax, bringing forward a balance of £91, there was for disposal a sum of £2551. The recommendation of the Committee was that, in view of the serious requirements of the district fund, a sum of £2250 should be handed over. The gas-works had been called the milch cow of the Corporation; and he thought it would be admitted that they had milked her very hard indeed. They ought to have put something to the reserve fund, as the amount standing at the credit of the fund had decreased from £2052 in 1895 to £1234. The gross profit he had announced would be equal to a dividend of 12 per cent. if the works were owned by a limited liability company. This was not at all bad for an undertaking which in the opinion of some people was on the verge of bankruptcy.

Mr. Hammond remarked that, owing to the sum which the Committee had been able to transfer to the district fund, combined with the efforts of other Committees to reduce their expenditure, there would be no increase in the district rate. This was of importance to working men, for they paid the rate indirectly, and whenever there was an advance there was a suspicion of a probable increase of rent. Some discussion had taken place in Committee with reference to a profit-sharing scheme for the gas-works, so that the workmen might have an opportunity of participating in its benefits; and he might say that where such schemes had been adopted with an honest intention, they had been of benefit to the concerns affected. They gave an incentive to the workmen to be more energetic. The Employers' Liability Bill now before the House of Commons had, like other Bills, its faults and its virtues; but the probability was that, if passed, it would be of some service to working men generally. However, the Gas Committee seemed to have anticipated the Bill, because they had already made provision for the insurance of the workpeople.

Alderman Peach said he was obliged to Mr. Hammond for mentioning the matter of the profit-sharing scheme, which was being considered by a Sub-Committee. He had omitted to state that the consumption of gas during April showed an increase of 9¼ per cent. compared with the corresponding month last year. It might be of interest to say that the Gas Department had paid off £1382 more in liquidation of loans than was actually necessary according to the Act of Parliament; so that a total of £3632 had really gone in reduction of the rates—a sum which was equal to a rate of 1s. 3d. in the pound.

The report was adopted.

HUDDERSFIELD CORPORATION GAS SUPPLY.

At the last Meeting of the Huddersfield Borough Council, the Gas Committee reported that the surplus balance of £8342 on revenue account for the year ending March last had been ordered to be applied in reduction of the amount expended on reconstruction account. Alderman Stocks, in moving the adoption of the Committee's minutes, said that at the close of the financial year the balance of profit to hand over to the relief of the suspense account that they had "hung up" was £8342, which was something like £2000 less than last year. He was quite aware that certain things might have been charged to capital account; but they had thought it better to keep this down as much as possible. Twelve months ago, they had a heavy loss by the firing of a stack of coal, and there was a lowering in the price of coke, both of which meant a loss of about £1000. Then this year they had to meet interest amounting to £998. Discounts were estimated at £700, whereas last year they had not this to contend with, because the amount which had been allowed previously had accumulated; and nothing was taken into account for this purpose. During the year, three poor fellows had lost their lives; and compensation to their families, and renewals to the works, had cost the Committee another £1000. So that if they added all these items together they would get something like £4698, which, had they been able to put it to the profit, would have made a sum of about £13,000. The Committee were hopeful that in the coming year they would not have accidents and circumstances similar to these to meet; and he was glad that the works had made a profit of £8342. The Committee were keeping them in as efficient a state as possible; and whatever was done was endeavoured to be made as permanent in character as possible. The motion was carried. With regard to working, the quantity of gas sold in the past year was 377,671,500 cubic feet at 2s. 9d.; 73,279,700 cubic feet at 2s.; and 802,300 cubic feet at 3s. 4d. In the year 1895-6, the sale was 376,878,400 cubic feet at 2s. 9d.; 62,176,800 cubic feet at 2s.; and 27,200 cubic feet at 3s. 3d.

LANCASTER CORPORATION GAS AND WATER SUPPLY.

The Annual Report and Accounts.

At the Meeting of the Lancaster Town Council last Wednesday, the reports of the Gas Engineer (Mr. C. Armitage) and Borough Accountant (Mr. W. Clough) for the year ending March 25 were submitted.

Mr. Armitage, in his report, stated that the total receipts for the year amounted to £23,849; and the expenditure, including £921 for new mains, &c., to £16,923—leaving a gross profit of £6926. After providing for interest on stock, mortgages, &c. (£3965), sinking fund (£1175), income-tax (£235), and reserve fund (£73), a net balance of £1478 remained for transference to the borough fund—making a total of £6926. The reserve fund now amounted to £12,000—the maximum allowed by the Lancaster Gas Act of 1880. With the addition of the £1175, the sinking fund now stood at £9880. Regarding the revenue account, Mr. Armitage stated that the receipts for gas showed a total increase of £348, of which about £300 was due to prepayment meters. Appended to the report was an analysis showing the cost of production, &c., and also a working statement. The net cost of gas was 1s. 4·40d.; interest on stock and mortgages, 6·42d.; sinking fund, 1·90d.; reserve fund, 0·12d.; and borough fund, 2·40d.—the average price realized per 1000 cubic feet of gas sold being 2s. 3·24d. The average cost of coal and cannel was 11s. 4·16d. per ton. Coke had contributed in return 4s. 4·57d.; and tar and ammoniacal liquor, 3s. 3·87d.—making the return for residual products 7s. 8·44d., or 67·88 per cent. of the cost of coal. The working statement showed that the total quantity of gas sold during the twelve months was 148,264,458 cubic feet—an increase of 4,216,063 feet (2·92 per cent.). Of the increase, prepayment meters contributed 1,942,521 cubic feet.

The report of the Borough Accountant, so far as the Gas Department was concerned, merely gave the general financial results of the working; and it again called attention to the remarks contained in previous reports as to curtailing the period for the repayment of the gas-works debt. Mr. Clough was of opinion that this point should receive serious consideration. In regard to the Water Department, the report stated that, compared with the year ending March 25, 1896, the income from the sale of water during the past year had increased by £963; while the expenditure on management and maintenance was £1723 less—this latter saving arising chiefly in respect of maintenance of reservoirs. The income last year amounted to £13,572; and the expenditure to £7914. The net profits for the year were £5658; being £2368 more than last year. The unexpended capital on the completion of the Damas Gill reservoir, &c., was £1190. The outlay on the Blea Tarn scheme was £11,599; and the whole of the authorized capital, except £804, was raised.

The Mayor (Mr. Helme), in moving the confirmation of the proceedings of the Gas Committee, said they had to report an increase in the receipts from gas of £348; the total amounts being £15,604, as against £15,256 last year. To this increase, prepayment meters, of which there were now 364, had contributed no less than £300. In the cost of lighting public lamps, there was a decrease of £67, owing to the development of lighting the streets by the electric light; but they had the satisfaction of knowing that, owing to the expenditure on the renewal of the retort-benches on the most approved system, they had been able to effect a saving in the amount of coal consumed of no less than £674. Repairs and maintenance, chiefly owing to the renewal of the retort-benches, showed an increase of £660; and the balance to net revenue account was £6926, as against £6858 last year. At the beginning of the year, they anticipated a clear margin of £1000 to hand over to the Finance Committee. By the changes effected in financial arrangements, they had had to pay only £1174 18s. 2d. to the sinking fund and stock redemption account, against £1574 last year—a saving of £399. Out of the net profits of £1551, there had been put aside £73 to make the reserve fund up to the maximum of £12,000 allowed by Act of Parliament. So that in spite of the very satisfactory development of the electric light, the Gas Department was able to show most successful results, and it was a matter for congratulation that the two sister branches of lighting were likely to be worked on profitable lines. Although the electric light had gone forward by such satisfactory leaps and bounds, the proceeds of the gas undertaking had increased by 3 per cent. They had used 200 tons less coal than last year; and of the coke produced, owing to the new generator furnaces, they now only used 14 per cent., as compared with 21 per cent. The coke sold was 8245 tons, against 7727 tons; and residuals showed a return on the cost of the coal of 67·88 per cent., as compared with 65·30 per cent. last year. The net cost of gas per 1000 cubic feet of gas sold was 1s. 4·40d., against 1s. 4·65d.

Mr. Bowness, in seconding the motion, expressed his satisfaction at the excellent results attained.

The motion was adopted.

BOLTON CORPORATION GAS SUPPLY.

A Successful Record of Progress.

At a Special Meeting of the Bolton Town Council held on May 22, an abstract of the accounts of the Gas Department for the past financial year was presented. It showed that the amount received from the sale of gas was £107,020; while residuals produced £25,464, and rents £660. The total on the credit side of the revenue account was £134,952; the other items including £944 for hired meters, and £862 from the gas-fitting trade. In the previous year, the amount received from the sale of gas was £105,153; the total receipts being £132,695. The principal items on the expenditure side are grouped under the following heads: Manufacture of gas, £65,426; distribution, £5719; rents, rates, and taxes, £4039; management, £1972. Particularizing the items under the first head, a sum of £43,340 was expended for coal and cannel, £11,127 in wages for carbonizing, £2607 in purifying materials and labour, £5037 for repairs, &c., and £2298 for the proportion of salaries and wages. In the case of distribution, the largest item is for salaries—viz., £3655; this being a proportion. A sum of £1014 is put down for repairs, and £665 for meters. The total expenditure was £77,758, against £79,029 in the preceding year; and the balance carried to the profit and loss account was £57,194, as compared with £53,666 before. Out of the profits, the Committee have handed over £24,057 in aid of the rates, against £21,000 in 1896.

Alderman Miles (the Chairman of the Gas Committee), referring to the accounts, said the year lately ended had been fairly satisfactory so far as progress was concerned. There had been made 10 million cubic feet more gas than in the previous twelve months, and with an expenditure of 25 tons less of coal and cannel. This did not mean that they had produced a worse quality of gas; on the contrary, the illuminating power during the year had stood at 18·14 candles, compared with 17·7 candles before. Then they sold more gas per ton of coal than was the case in the preceding twelve months—in fact, more per ton than for many years past. This showed that they had excellent appliances as well as good management. The number of consumers had increased by 1692; and a very gratifying feature was the large demand for penny-in-the-slot meters. Financially, the year had been very satisfactory; and he thought members of the Council would say so when they had examined the abstract of accounts presented to them that morning. Their capital account had been depreciated by £139,563, made up as follows: Repayment of loans, £57,000; bonus to old shareholders, £22,750; old sinking fund written off, £2512; depreciation of works and mains, £11,483; and sinking fund accumulation, £51,815. Reviewing the work of the department during the past 25 years, he stated that the Gas Company's expenditure up to 1872 was £190,175; and the Corporation gave £440,785 for the undertaking—equal to 28s. 10d. for every 1000 cubic feet of gas they were able to sell. To-day, owing to their depreciation,

the capital expenditure stood at £626,307, or 14s. 10d. per 1000 cubic feet of gas sold. This showed that their capital account, taken on this basis, was only about half what it was a quarter of a century ago. In 1872, the number of consumers was 14,800; now they had 34,100 on the books—an increase of 19,300. The sale of gas in 1872 was 304,585,000 cubic feet; in 1897, it had risen to 840,830,000 cubic feet—an increase of 536,245,000 cubic feet, or 176 per cent. The income in 1872 was £60,876; whereas for the past year it amounted to £134,952—an augmentation to the extent of £74,076, or 122 per cent. The price of gas in 1872 within the two-mile radius was 3s. 4d. net; to-day it was 2s. 6d.—a reduction of 10d., or 25 per cent. These figures showed that the progress of the Gas Department had been eminently satisfactory, not to say marvellous. There was scarcely a piece of the machinery in existence in 1872 in use at the works now—indeed, all he could point to was a couple of gas-holders in Spa Road. The capabilities of the works were enormous; and it was a fact that they could manufacture 15 per cent. more gas than they were doing, without the expenditure of a single penny of capital. In conclusion, he referred to the electricity works, and said the net loss for the year was only £102 18s.; adding that there was every reason for anticipating a profit from the department next year.

In the course of a short discussion which followed,

Mr. Melling suggested that, in view of the enormous profits made by the Gas Department, the Committee should further reduce the price of gas, which would be a boon to small consumers.

The Mayor (Alderman Dobson), in complimenting Alderman Miles upon the statement presented to the Council, said that, having gone carefully into the accounts, he was pleased to say they would stand the closest examination. He added that there were no gas-works in the country better managed than those belonging to the Bolton Corporation.

The Withdrawal of the Gas Clauses of the Improvement Bill

At a meeting of the Finance Committee of the Bolton Town Council last Friday, the Town Clerk reported upon the Corporation's Improvement Bill now before Parliament. In reference to the withdrawal of the gas clauses of the Bill, to which allusion was made in the "Journal" for the 18th ult., he stated that it was deemed expedient, in view of the opposition of the Rural District Council, and the negotiations in progress for an extension of the borough boundaries to remove them from the Bill. At the last meeting of the Turton District Council, the same subject formed the basis of a very lengthy discussion. The Chairman (Mr. T. G. S. Garnett) explained that in the beginning they offered to accept from the Corporation a reduction in the price of gas and the abolition of the meter-rents, with power to purchase all the gas-mains in the Turton district on fair and reasonable terms. The Corporation, however, said they could do nothing in the way of reducing the price or taking off the meter-rents, but would agree to a clause being inserted in the Bill for the purchase of the mains in the Turton district on certain conditions. These the Turton Council could not accept; so they opposed the Bill. Forty or fifty gentlemen were put to a great deal of trouble in going to London for this purpose; and at the last moment the Corporation withdrew the gas clauses rather than fight. Mr. Garnett expressed his belief that the clauses were withdrawn by the Corporation in view of a probable extension of the borough boundaries; the gas profits being one of the "plums" offered to the townships proposed to be incorporated. Mr. J. Booth, J.P., speaking from twenty years' experience, said he was satisfied that the Corporation would have been beaten on the gas clauses had they contested the matter before the House of Commons Committee. He held that it was an injustice to them that they should be paying a price for gas which was yielding a profit to Bolton for the reduction of the borough rates. The Parliamentary Committee having the matter in hand were thanked for their services.

DENTON GAS DEPARTMENT.

The Annual Accounts.

The accounts of the Gas Department of the Denton Urban District Council for the year ending the 31st of March last, certified by Messrs. Nairne and Son, have been issued. They show that the gas-rents (less allowances) amounted to £8341; the meter-rents, to £133; residuals produced £1731 (coke realizing £1040); and the total revenue was £10,302. The manufacture of gas cost £4526, of which £2833 was for coal and £1171 for salaries and wages; distribution came to £601; and management to £738. The total expenditure was £5866; leaving a balance of £4436. Of this sum, interest on loans, annuities, and sinking fund charges for the year absorbed £3506; leaving a balance of £930, of which £600 is to be handed over to the Council for the relief of the rates. Appended to the accounts are some particulars in regard to the manufacture of gas for the past financial year, furnished by the Gas Manager (Mr. J. Chadwick Smith). The quantity of coal carbonized was 6477 tons; costing 8s. 8·97d. per ton. The make of gas was 71,259,000 cubic feet, of which 63,961,600 cubic feet were sold—a difference of 7,297,400 cubic feet, or at the rate of 10·24 per cent. loss. Calculated at per 1000 cubic feet, the cost of gas made was 1s. 3·24d.; and sold, 1s. 5·26d. The selling price being 2s. 7·29d., the gross profit was at the rate of 1s. 2·03d. The annuities, interest, and sinking fund charges work out to 1s. 1·14d.

The London County Council's Expenditure on Water Bills.—The Finance Committee of the London County Council reported at the meeting last Tuesday that the total amount expended by the Council since its formation, in the promotion of its various Bills and in opposing Water Bills is £32,489.

A Large Water Scheme for Bacup.—An important scheme of water-works extension will shortly be submitted to the Bacup Town Council. It has been prepared by Mr. James Diggle, of Heywood, and will probably entail an expenditure of about £120,000. It is proposed to pay £36,000 for a supply and gathering area at Coupe, within the borough, and to erect two reservoirs; the principal one to hold 150 million gallons, and to cost £50,000. This will be at an altitude of 1012 feet; and to supply the highest parts of the borough, Mr. Diggle recommends the construction of a small reservoir at 1225 feet above the sea-level.

THE "DIAMOND JUBILEE" OF THE CARDIFF GAS COMPANY.

Presentation to the Directors—Dinners to the Employees and Office Staff.

In connection with the "Diamond Jubilee" of the Cardiff Gas Company, which was incorporated by Act of Parliament on the 5th of May, 1837, a function of a very interesting character took place last Wednesday at the Company's offices, when an address, to which all the staff and employees had spontaneously subscribed, congratulating the Company upon their sixty years of progress and the attainment of their present prosperous condition in the town, was presented to the Chairman and Directors. The address was a really splendid work of art. Around the floral portion were reproduced the portraits of all the present Directors and the chief officials; while the centre-piece formed a beautifully executed group of all the past Chairmen of the undertaking since its formation. The deputation presenting the address, consisting of representatives from every branch, were introduced by Mr. J. Parry, the Assistant Engineer; and the address having been read by the Hon. Secretary of the movement (Mr. W. J. Davies), the presentation was formally made by Mr. W. Price and Mr. F. Andrews, each having a record of more than forty years' continuous service in the Company. The Chairman (Mr. C. H. Williams, J.P., D.L.), on behalf of himself and his colleagues, in a few well-chosen words accepted the address.

The proceedings were followed by a luncheon given by the Directors. Responding to the toast of "Success to the Cardiff Gas and Coke Company," Dr. Taylor gave some interesting particulars in reference to the early history of the concern. Dealing with its inception at a town's meeting on Nov. 21, 1836, presided over by the then Mayor of Cardiff (the late Mr. C. C. Williams), who was the first Chairman of the Company, and held this position until his death in 1860. Dr. Taylor stated that gas was first made and supplied to the public on March 25, 1839. At that time gas was sold at 10s. per 1000 cubic feet; but some consumers contracted to take it at a fixed price per burner—the rates varying from 7s. 6d. to 15s. per light each quarter, according to the number of hours agreed upon. The population of Cardiff then was less than 10,000; and the number of gas consumers was necessarily limited. Fifty years ago—viz., in 1847—or after eight years' working, the quantity of gas sold in one year was only about half the amount now consumed in a single day. Moreover, at the present time many individual consumers burned more gas than the whole town supply at that period. An enormous increase in the development of the Company took place during the ten years 1880-90, when the gas consumption was doubled. From 1890 to the present time, this high rate of increase had been fully maintained; and there was every probability of all former records being eclipsed at the end of the present decade. Dr. Taylor concluded his speech by paying an eloquent tribute to the officers; making special mention of the invaluable services rendered to the Company by their able Engineer and Manager (Mr. Henry Morley, M.Inst C.E.) and their energetic Secretary (Mr. George Clarry), both of whom enjoyed the full confidence of the Board.

In commemoration of this important event in the history of the Company, the Directors invited the whole of their workmen, numbering nearly four hundred, to a dinner, followed by an entertainment, which was greatly appreciated by all the workmen, and added to the already existing good feeling between the Board and their employees. The Directors also did not forget the office staff, the members of which, to the number of about forty, were entertained at a banquet in the new offices of the Company. At each of these festive gatherings the Chairman, accompanied by several of the Directors, was present; and he took the opportunity of assuring the men that, in addition to the celebration of the Company's "Diamond Jubilee," that of Her Majesty would be duly observed. There would be a whole day's holiday on the 22nd of June, when every employee would receive full pay.

NEWBURY CORPORATION GAS SUPPLY.

Improved Position of the Gas Undertaking.

At the last Meeting of the Newbury Corporation—the Mayor (Mr. R. Long) in the chair—the report of the Gas Committee for the year ending March 31, accompanied by the balance-sheet and the working statement of Mr. R. M. Couper, the Manager and Secretary, was presented. The profit made was £2137, or at the rate of 8¼ per cent. on the capital invested in the undertaking. This was in excess of the sum realized in any previous year; and the Committee recommended that the charge for the public lamps should be reduced from £3 5s. to £3 per annum. The working statement showed that the quantity of coal carbonized was 2790 tons, from which 31,285,000 cubic feet of gas, or 11,213 cubic feet per ton, were made, and 27,595,000 cubic feet, or 9891 cubic feet per ton, were sold. The working expenses per 1000 cubic feet of gas sold came to 15·62d.; do., less rates and taxes, to 13·65d.; do., less public lighting charges, to 14·14d. The total working expenditure, less residuals, amounted to £3703; and the income was £5840—leaving the amount of profit above named. Of this, £1382 goes to the sinking fund and in payment of income-tax, interest, &c.; leaving a surplus of £755 on the year's working.

Mr. Smith, in moving the adoption of the report, said he thought the Council and the Committee were to be congratulated on the present satisfactory state of the gas undertaking. It had been a source of a good deal of criticism from time to time—some fairly reasonable, and some very unreasonable. Without, however, going into past balance-sheets, he would compare last year's with the present one. In 1895-6, the gross sales were £6861; the expenditure, £5019; and the net profit, £1842. In 1896-7, the gross sales amounted to £6965; and the expenditure, to £4828—showing a net profit of £2137. In 1896 they carried forward £88; but this year the amount carried forward would be £381. Not only had this been accomplished, but the whole of the £4000 and £3000 on the old works had been written off out of the profits. The last instalment on the £3000 they now proposed to pay off this year. The leakage, though still high, had been reduced by a million cubic feet; and with ordinary zeal on the part of the Committee and the Manager, the unaccounted-for gas would be brought down to a normal level. The

manufacturing results showed the wisdom of the Committee in recommending the Council to expend money in bringing the works up to date. They were now in a good state, and reflected great credit upon the Manager. In recommending that the price charged for the public lamps should be reduced, the Committee thought this would be the fairest way of dealing with the profits.

Mr. KNIGHT seconded the motion.

Alderman JACKSON remarked that his criticisms would be of a more friendly character than those he had previously offered, as he really thought the balance-sheet was satisfactory; and therefore he must congratulate the Chairman and Committee on the result of their work.

Mr. MIDWINTER said they had now arrived at a time when they might look forward to the price of gas being reduced; and so he wished the Committee had made up their minds to lower it 6d. per 1000 cubic feet. He thought this would have been more appreciated than a reduction of 5s. on the public lamps.

Alderman JACKSON said he considered it would be suicidal to reduce the price 6d.

Alderman HOPSON said he approved of reducing the charge for the public lamps, rather than lowering the price to private consumers, though he would personally benefit thereby. He thought they should consider the general ratepayers; and this reduction was, in his opinion, the right thing.

The MAYOR, in putting the motion, added his congratulations to the Chairman and the Committee on the good balance-sheet presented.

The motion was carried.

THE BOARD OF TRADE AND THE WIMBORNE GAS ORDER.

One of the Gas Orders Confirmation Bills now before the House of Lords contains an Order applied for by the Wimborne Minster Gas and Coal Company, Limited, to enable them to maintain and continue their works, make extensions thereto, and manufacture and supply gas in the parishes of Wimborne Minster, Colehill, and Pamphill, in Dorset. The following local and road authorities were interested in the application: The Dorset County Council, the Wimborne Minster Urban District Council, the Wimborne and Cranborne Rural District Council, and the Pamphill and Colehill Parish Councils. The consents of these authorities were withheld; and all of them except the Dorset Council lodged objections to the proposed Order. The promoters thereupon asked the Board of Trade to exercise the powers conferred upon them by section 4 of the Gas and Water Works Facilities Act, 1870, of dispensing with such consents. The Board thereupon appointed Lieut-Col. H. A. Yorke, R.E., to hold a public inquiry into the matter at Wimborne, and report to them thereon. This was done, and the substance of his report was communicated to the Wimborne Minster District Council shortly afterwards (see *ante*, pp. 551, 733). He reported that, with a view to meet the objections of the local and road authorities, the promoters had offered to omit the parish of Pamphill from the proposed limits of supply, and to make certain amendments in the draft Order with regard to capital, illuminating power, standard price, repair of roads, &c. Subject to the Order being amended in these respects and in the manner indicated in his report, Colonel Yorke was of opinion that the promoters had established their claim to an Order, and that the consents of the above-named authorities should be dispensed with. He also reported that the Urban District Council of Wimborne desired that a clause should be inserted to compel the Company to sell their undertaking to the Council as a non-statutory concern if the Council obtained power to purchase within three years, but that the promoters refused to accept any such clause. He expressed the opinion that there was no reason in this case to depart from the usual practice of inserting any such clause only when agreed to by both parties. The Board of Trade accordingly decided to grant an Order giving effect to the recommendations contained in the report, and to dispense with the consents of the local and road authorities. The Order has accordingly been included in one of the Confirmation Bills; and a special report has been presented to Parliament by the Board, setting forth their reasons for so doing.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, E.C., last Wednesday, Mr. Alfred Richards sold by auction stocks and shares in several gas and water undertakings. An issue of 500 £10 "C" shares in the Harrow and Stanmore Gas Company, by order of the Directors, was put up in lots of ten, five of which were knocked down at £12 15s. per share, and the rest at £13 each. The sale produced £6487 10s.; the average price per share being £12 19s. 6d., which returned £4 0s. 11d. on the investment. The last dividend on this class of shares was at the rate of £5 5s. per cent. per annum. Another issue, by instructions of the Directors, was 500 £10 shares in the Southend Water Company, which were sold at an average of £16 2s. 4d. per share; returning £3 2s. per cent. to the investor. The last dividend on similar shares was at the rate of 5 per cent.; but they rank, as do those noticed above, for a maximum of 7 per cent. A parcel of £390 of 5 per cent. perpetual debenture stock of the Wandsworth and Putney Gas Company fetched £166 per £100; some ordinary consolidated "B" stock of the Hornsey Gas Company was bought at an average of £200; "D" stock of the Tonbridge Gas Company, at £211; and Brentford consolidated stock, at £299, £300, and £301—the official quotation for the day being £287–92. A small parcel of "D" gas stock of the Barnet Gas and Water Company was bought in; but some "D" water stock was sold at the rate of £165 per £100.

Among the sales of shares last week, the following may be noted: On Monday, at Harwich, 85 original £5 shares in the Harwich Gas and Coke Company, the last dividend on which was at the rate of £7 10s. per cent., were sold at an average of £7 10s. each; 19 new £5 shares in the same Company (last dividend £5 10s. per cent.), at £5 12s. 6d. each; and 15 similar shares at £5 15s. apiece. A parcel of original £25 shares in the Winchester Water and Gas Company changed hands on Wednesday at an average of £63 12s. 6d. each. On Friday, 26 lots of £10 "B" stock of the Ipswich Gas Company were sold at an average of £25 per share. At Farnworth, on the same day, Mr. A. Darbyshire offered for sale two lots of shares in the Farnworth and Kersley Gas Company. £60 of "A" stock realized £160 10s.; and £100 of "B" stock fetched £184 10s.

MONTE VIDEO GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Friday, at Winchester House, E.C.—Mr. A. K. MACKINNON in the chair.

The SECRETARY (Mr. A. G. Hounsham) read the notice convening the meeting; and the report and accounts, which were summarized last week, were taken as read.

The CHAIRMAN, in commenting upon the accounts, first dealt with the balance-sheet. He pointed out that several of the items on the debit side were practically the same as last year. But the contingency fund stood at £26,358, which was £920 less; and the item of profit and loss was £31,552, as against £33,727. Turning to the credit side of the balance-sheet, he said it would be observed that the Directors had written off from capital expenditure £1108 for depreciation; while the expenditure on new and additional mains and services and meters had been £1862. This expenditure was larger than it would have been owing to the fact that they had had to fix new meters on the metrical system. The stock of materials was £35,489, against £31,549; and the difference was partly accounted for by the stock of coal, which was more by £2248—representing nearly 700 tons more in the quantity in store than in the previous year. Materials for use and sale also showed an increase of close on £1600. Sundry debtors had decreased by £2678, which was a satisfactory feature. At the same time, the Directors were sorry to be obliged to call attention to the Government account (which was still owing) of £5611. Of course, they were entitled to claim interest on this amount; but they had not taken credit for it in the accounts. The investments stood at £57,273, as against £64,463; and the difference was in part accounted for by the sale in July last of one of the stocks which the Company held. On December 31 last, they had on deposit £15,000, as against only £1600 in the previous year. Of this, however, the Company required £4600, on January 1, to pay off the drawn debentures. Part of the remainder had since been invested; so that now their British, Colonial, and Foreign stocks, shares, and bonds stood at about £62,000. Turning to the revenue account, the first item on the credit side—sales of gas, residual products, meter-rents, and profit on sales of fittings and materials—was £65,834, as against £70,213. The bulk of the difference was accounted for by the reduction of 12½ per cent. in the price of the gas, and by the fact that the Company had lit a smaller number of public lamps. On the other hand, the revenue from the dock, &c., had increased by £3892; so that the total at the credit of the revenue account was within some £500 of the revenue of the previous year. Referring to the debtor side of the account, he said the cost of manufacture was about £2379 more. This was chiefly due to the increased price of coal and higher freights. Directors' fees, salaries, and other London expenses were £488 less. The result of all this was that the balance carried to the profit and loss account was £25,648, as compared with £28,024, or £2376 less, which, he ventured to say, was by no means an unsatisfactory amount; for the shareholders would remember that at the last meeting he told them that the Directors expected a diminution of something like £3000 or £3500 through the reduction in the price of gas. The profit and loss account showed that, without touching in any way the reserve account, they were enabled to pay the full dividend of 5 per cent., and to carry forward an undivided balance of £4456. Adverting to the question of the price of gas, the Chairman said that, at the last annual meeting, the shareholders assented to a further reduction of 50c. per 1000 cubic feet, or 12½ per cent. This, added to a 20 per cent. reduction in 1887, made a total of 32½ per cent. in ten years. These reductions, effected on so liberal a scale for the benefit of the authorities and the public generally, were almost unique in the history of a gas company, and should not be forgotten (independently of other weighty considerations) as entitling the Company in return to be treated, if not generously, at least fairly. He confessed that the Directors had been influenced by the experience obtained by gas companies in this country, where a reduction of, say, 1d. per 1000 cubic feet accomplished such excellent results in stimulating consumption; and it was difficult to imagine that like prosperity would not flow to them as a reward for the heavy sacrifices they had made. But the unforeseen events and misfortunes that had swept over the country had kept back—let them hope only for the present—the prosperity which they expected was within their grasp. It would be remembered that the 12½ per cent. reduction commenced on July 1 last. But unhappily soon after this their income became sensibly reduced owing to the above causes; and the anticipated increase was retarded by the political unrest which followed an unprecedented invasion of locusts. As he stated at the last meeting, taking a pessimistic view of the result of the reduction, the loss for the half year would be from £3000 to £3500. The net deficit in the amount required to pay the 5 per cent. dividend had, he was glad to say, turned out to be only £2175; and this was fully provided for by the undivided profits brought forward from last year, without trenching on the reserves. During the year, 47 additional consumers were obtained; and in the second half, the increase in the private consumption was 280,868 cubic feet—equal to a trifle more than £209—which, in view of the political disturbances, was satisfactory. He also mentioned that a pamphlet was being prepared giving the comparative values of different classes of fuel employed in the country, and showing their inferiority to coal gas as a heat-giving agent in point of economy, efficiency, convenience, &c., for a large number of culinary operations. This was being translated into Spanish for distribution in Monte Video; and he thought they could not fail to derive good results from it. Later in the proceedings the shareholders would be asked to authorize the Directors to apply to the Court to obtain for the Company the necessary powers to deal with electricity and any other illuminating agents. He might say that they had no present intention of incurring any expense in the matter of adopting electricity or any other method of lighting. But the Board thought that, under existing circumstances, the Company should be armed with full powers to do what other lighting companies had already done; and as there might be some doubt as to whether or not the Company already possessed such powers, the Directors had been advised to ask the shareholders to enable them to make their powers absolutely clear. He need hardly say the Board would not expend the capital, or enter into any important engagement, without first consulting the shareholders. He concluded by moving the adoption of the report and accounts.

Mr. M. T. Hood seconded the motion, which was at once unanimously carried.

On the proposition of the Chairman, seconded by Mr. T. C. Tatham, a dividend of 10s. per share was declared; making, with the interim payment, 5 per cent. for the year.

The retiring Directors (Messrs. M. T. Hood and Robert Morton) and the Auditors were re-elected.

The Chairman moved a resolution extending the objects of the Company by the addition to clause 3 of the Memorandum of Association of a sub-clause providing for the generation, production, and distribution of electricity or any other illuminating agent, and also authorizing the Directors to apply to the Court to confirm the resolution.

Mr. Barber, who seconded the motion, thought the Directors were taking a step in the right direction. He believed there was already an Electric Lighting Company in Monte Video; and perhaps the Directors would inform the shareholders if they were likely to be opposed by them; or if they thought they would get power to enter into electric lighting.

Mr. Tatham explained that the Directors had made this proposal not with the idea of immediately rushing into electric lighting, but in order to be prepared, so that, in the event of favourable circumstances arising, they might be able to take advantage of them.

The Chairman, in reply to a question, said he could not say the present electric lighting undertaking was a success. It was still going on; but it had never paid a dividend, nor had anything been set aside for depreciation. It was virtually a Government institution.

The resolution was carried unanimously.

The thanks of the shareholders were accorded to the Chairman and Directors and the officials; and the proceedings terminated.

CAPE TOWN AND DISTRICT GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Friday, at Winchester House, E.C.—the Hon. H. Noel in the chair.

The Secretary (Mr. J. A. Kelman) having read the notice convening the meeting, the report for the year ending December 31, 1896, the principal figures in which were given in the "Journal" last week, was presented.

The Chairman, in moving the adoption of the report, said the proprietors would observe that it showed a notable slackening of the exuberant prosperity which had attended the Company during the past three or four years. In 1894, there was an increased make of 14 million cubic feet of gas as compared with 1893; in 1895, the increase was 12 millions; while last year it was only about 4 millions. The cause of this was the electric light. The Municipality of Cape Town had installed this illuminant; and by so doing they had not only taken away the Company's street lighting, but several of their best customers also. He did not know that this was altogether a bad thing, under the present circumstances, because when there was a large augmentation of the consumption of gas, there was of necessity a considerably increased outlay of capital to meet it. The Company had spent so much money lately, that they were positively glad of a little breathing-time in order to enjoy their prosperity; and the Directors were taking steps to see how they could turn the electric light to the best account. Various matters had worked adversely during the past twelve months; one being the large increase in the rates for freightage, and another the great leakage. He believed 24 per cent. of the gas produced was lost in the course of last year. This was because there had never been a time when the Municipality had done so much to the streets; and this had, of course, very much shaken the Company's pipes. Notwithstanding these drawbacks, the Directors were able to present accounts which showed that they were in a position to recommend a dividend which would give the shareholders 8 per cent. per annum for their money. He thought they would admit that this was not bad interest on their investment. This had been effected by good management in two ways—commercially and financially. As to the former, he thought they had better not say much; but with respect to the latter, he could state that the Directors had made use of the excellent credit of the Company to pay off £50,000 of debentures bearing 6 per cent. interest, and to replace them with stock on which only 4½ per cent. was paid. In this way they saved £750 for interest; and moreover they received £6000 premium on the stock. This gave them what they had never had before—viz., working capital; and they were now in a comfortable position. They had only a debt of £2000; and this would be paid off as fast as possible. For this good financial management they had to thank very much their new Director, Mr. Lilley.

Mr. H. R. Savory seconded the motion; and it was carried unanimously.

Mr. R. A. Fairclough was re-elected a Director, and Messrs. C. G. Kemp, Ford, and Co. were re-appointed Auditors.

Improved Gas v. Electric Lighting at Exeter.—The announcement of the intention of the Exeter Corporation to light a portion of the city thoroughfares by electricity, has not been allowed to pass unnoticed by the Gas Company. At a meeting of the Corporation last Wednesday, a letter was read from Mr. W. A. Padfield, who wrote, on behalf of the Company, suggesting that certain large lamps and lanterns standing at different points should be allowed to remain. In one of these the Company has placed a five-cluster burner, which, said Mr. Padfield, will bear favourable comparison with any other system of lighting. The illuminating power is three times as much as before, while the consumption of gas is practically the same; and having regard to the increased duty obtained from the gas in comparison with the old system, the price worked out at only 10d. per 1000 cubic feet. Though the burners are expensive, Mr. Padfield suggested that the Directors might place in other positions, at their own charge, similar or superior burners. He pointed out that one electric arc lamp would not effectively light an area of 100 feet by 50 feet, while one Denayrouze eight-light cluster would do so. The electric arc would require at least one unit an hour, costing 6d.; while the Denayrouze light required 70 cubic feet of gas per hour, costing a little more than 2d. The Town Clerk and Surveyor were directed to have a conference with the officials of the Company on the matter.

INCANDESCENT GAS LIGHTING IN INFIRMARIES.

The paragraph on the subject of the "Management of Incandescent Gas Lighting" which appeared in the "Journal" last week has attracted the attention of a correspondent who, while being officially interested, as a Director of two of the London Water Companies, in the questions bearing upon water supply which are dealt with in our columns, is at the same time, as Chairman of a Metropolitan Board of Guardians, keenly alive to any saving which can be effected in the cost of lighting the buildings under his supervision, without the sacrifice of efficiency. He has accordingly turned his attention to incandescent gas lighting, which has been installed in the Workhouse Infirmary of his parish, and has sent some figures taken from the Steward's report for the six months ending March 25. There are 180 lights in the wards; and, in addition, 54 in the officers' quarters. The following are details of the materials used to maintain these burners for the six months:—

Wards.

Burners in Use.	Mantles Used.	Mantles Used per Burner.	Average Life per Mantle. Months.	Chimneys Used.	Shades Used.
15	35	2·33	2·57	6	1
15	27	1·80	3·33	8	4
15	22	1·46	4·17	3	1
15	32	2·13	2·34	7	3
15	20	1·33	4·51	4	1
15	34	2·26	2·65	16	2
15	29	1·93	3·10	10	6
15	31	2 06	2·91	15	..
15	40	2·66	3·25	21	4
15	32	2·13	2·34	5	1
15	33	2·20	2·72	8	1
15	44	2·92	2·05	11	..

Residences.

9	34	3·77	1·56	14	..
11	8	0·77	7·77	3	..
5	5	1·00	6·00	..	..
11	10	0·90	6·60	..	..
16	26	1·62	3·70	11	..
2	3	Not maintained fully.			

It will be seen by these figures that the maintenance of an incandescent lamp varies considerably according to its position and use. Some departments work absolutely without difficulty; whereas others are always in trouble. It should be explained that the statistics in regard to the wards are trustworthy, as each ward is under precisely similar conditions. In the residences, however, the conditions vary.

The following table shows the economy effected by the introduction of the incandescent system:—

Total Consumption of Materials for Six Winter Months to Maintain 234 Incandescent Gas-Lights.		Total Consumption of Gas for Two Winters, in Cubic Feet.		
480 mantles	£27 19 4	Dec., 1895	2,317,800	5,083,400
159 chimneys	7 5 9	Mar., 1896	2,765,600	
10 dozen rods	0 4 7	Dec., 1896	2,187,400	4,481,800
13 over-shades	0 19 0	Mar., 1897	2,294,400	
Repair of burners	0 7 6	Decreased consumption		601,600
	£36 16 2	Value		£85 4 6

The result of the six months' work is therefore a saving of £48 8s. 4d. with the wards not only efficiently, but rather over lighted. It is acknowledged that some of the economy effected must be set down to the brighter weather prevailing in the few weeks immediately preceding the date of the report; but the Steward had no hesitation in saying that, light for light, the incandescent was more efficient and economical than the ordinary burner.

ELECTRIC LIGHTING NOTES.

The Chairman of the Hastings Electric Light Company, at a meeting held last Tuesday to consider the sale of the undertaking to the Hastings Corporation, stated that the proposal would not have received his advocacy if it had been possible for the Company to raise money at 3 or 4 per cent.; but they could only raise it at 5 and 6 per cent. At no time could money be obtained on more favourable terms than the present; and if a company cannot get accommodated at less than 5 or 6 per cent., it is a sign that financiers do not regard the concern as a particularly safe investment. And yet the Hastings Town Council have contracted to pay £58,000 for the Company's business.

The Chairman of the Electric Lighting Committee of the Hull Corporation (Mr. Skinner) submitted to his colleagues last Thursday the accounts of the undertaking for the fifteen months ending March 31 last; the additional three months having been added in order to bring the closing of the accounts in line with those of the other departments. The change, Mr. Skinner said, had involved the charging of amounts to the sinking fund within the fifteen months sufficient to cover two years' working. Even after doing this, the net profit to be carried to reserve was £1931; whereas, if only fifteen months' sinking fund payments had been charged, the net profit would have been £1100 more, or £3031 altogether. He also remarked that it was satisfactory to find the business had been steadily increasing, and that additional consumers had been connected during the past twelve months to within a few of the number taken on in the previous year.

"Though the accounts of the Electric Light Department of the Tunbridge Wells Corporation bear a favourable surface statement as to receipts and expenditure," writes a local correspondent, "the quality and extent of the lighting cannot, unfortunately, be worked out along such figures, or it would be seen that there, as at other places, a considerable proportion of the so-called gain or profit is derived from the economy (?) which lights up the main streets and roads, but leaves the back streets and byways in darkness, whereas in the days of gas the lighting was over the whole area alike. By this sort of economy, or rather starving, surpluses may be manufactured; but it is a system which cannot endure. At Tunbridge Wells there are numerous complaints; and the darkness of streets forms the subject of frequent discussion at the meetings of the

Town Council. But the Lighting Committee, though they make plenty of promises, do not carry them out, on the plea of the expense which would be entailed in lighting up all the town with the electric light. So that those who live in localities which were formerly lit by gas have now to pay and grumble, in order that the front streets may be lighted."

There seems to be a little financial difficulty in the way of the Sheffield City Council purchasing the property of the local Electric Lighting Company in accordance with the powers secured by them in the Provisional Order of 1893. They apprised the Company of their intention. But the latter have pointed out that the notice is invalid on the ground that the Corporation have not any power to issue such an amount of Corporation stock as would produce by the interest or dividend thereon an annuity of 5 per cent. per annum upon the amount properly expended by the Company on the undertaking, and chargeable to capital account; and they are, therefore, not entitled at present to require the Company to sell their undertaking under the terms of the Order. It is now proposed to make an offer to the Company of a sum of £200 of new 2½ per cent. Corporation stock (or in the alternative £200 in cash) for every £100 properly chargeable to capital account, together with a sum in cash equal to the aggregate amount of a dividend of 5 per cent. per annum on the capital expenditure, less the aggregate amount of the dividends declared by the Company from the dates of such expenditure.

The electric light party on the Hampstead Vestry have received an ominous check from the ratepayers by the defeat of Mr. Read, the able Chairman of the Electric Lighting Committee, at the polls. To add to their chagrin, Mr. Richardson, the leader of the small body of malcontents, was again returned by his ward at the top of the poll. At last Thursday's meeting, the Committee reported that they had carefully considered the report of Major Cardew on the fatal accident which occurred to an employee of the Vestry; that the Chief Electrical Engineer had been in communication with Major Cardew as to the suggestions made by him in the report; that the measures now being taken by the Committee were such as had been approved by, and were to the satisfaction of, Major Cardew; and that the means whereby such measures should be carried out had already, in part, been sanctioned by the Vestry. They recommended the purchase of certain appliances, and the alteration of portions of the plant. In reply to a member, the Vestry Clerk announced that the widow of the deceased had entered an action against the Vestry for compensation. Mr. Newton asked why she should have had to consult a solicitor at all; and Mr. Buckle (a new member) declared that his constituents considered this a shabby piece of business on the part of the Vestry, who ought to have voluntarily settled the matter at once. The Chairman ruled the discussion out of order, and so prevented any further protest.

The electric lighting undertaking of the Newcastle (N S.W.) Corporation is decidedly in a bad way; and the position of affairs was lately discussed at a special meeting of the Town Council convened for the purpose. Owing to a mishap to the machinery of the electric lighthouse, there had been a failure of the light; and the opinions of the Chief Engineer and the Electrical Engineer (Messrs. M'Donald and Moncrieff) of the *Indianapolis* had been asked upon the condition of the plant generally. These gentlemen said the trouble was confined entirely to the motors, and not to the plant; and Mr. Moncrieff disagreed entirely with some of the methods in operation. Reviewing the whole plant, he stated it was much behind the times, and none of the machines were excellent. As a whole concern, the plant could not be classed as up to date. The Mayor (Alderman Miller) said that since the works had been taken over from the contractor, some three years ago, the expenditure upon them had been £1800 or £1900 above the income; and there was every appearance that it would be heavier. He referred to the erratic manner in which the light had been seen of late. He thought the Council should take some steps immediately. The Town Clerk made a statement showing the income from the works up to date to have been £12,344, and the expenditure £14,923; making the amount of expenditure over revenue £2579. Alderman Asher thought the time had arrived when they should get some expert evidence as to the state of the plant; and he proposed a motion to this effect. Alderman Rogers seconded the proposal. Alderman Moroney, in supporting the motion, expressed regret at the position in which the city was placed by the failure of the electric light. They were in a difficulty, and they should get out of it. How was it, he asked, that accidents like those which had occurred at Newcastle were almost unheard of elsewhere. Alderman Sharpe thought it would be advisable to make an investigation into the cause of the breakdown, and the previous stoppages. The motion was carried.

Gas Exhibition at Exeter.—In conjunction with a gas exhibition held by the Exeter Gas Company in the Public Hall in that city during the week ending the 22nd ult., a series of cookery lectures were delivered by Miss Richards. The Company endeavoured to show the latest development of gas lighting, for they exhibited, both inside and outside the hall, the Denayrouze light.

The Chester Gas Company and their Customers.—A five days' exhibition of gas appliances recently held in the Music Hall, Chester, with cookery demonstrations by Miss Knott, afforded the Chairman of the Gas Company (Mr. J. Gamon) an opportunity of making an interesting statement as to the relations of the Company with the Corporation in regard to the public lighting, and to the consumers. He pointed out that the Company were a commercial undertaking, and that there were two interests which the Directors were bound to look after—the interest on capital, and the right of the consumer to a supply of gas at the lowest price. The second object was not overlooked in considering the first. The gas proprietor was not so well paid an individual as had been represented. The anxiety of the Company that the gas consumers should have the best and purest article which they could manufacture had been persistent. The Directors did not wish to lose dividends; but they did desire to reduce the price of gas, and to supply it of the best quality. On the 1st of January last, the price of gas to consumers in the out-districts was reduced by 3d. per 1000 cubic feet; bringing them to the same terms as those in the city. The Directors had decided to increase the quantity supplied through automatic meters from 20 to 25 cubic feet for 1d. from the 1st of July next; and they hoped before long to make a further reduction in price to the general consumer.

METROPOLIS WATER SUPPLY.

The Government Bill.

The Bill introduced by Mr. Chaplin on Monday last week, as briefly announced in the "JOURNAL" on the following day, has been printed. Its object is to "amend the law respecting the Metropolitan Water Companies;" it is to be cited as the Metropolis Water Act, 1897; and it will come into operation on the 1st of November after the date of passing. Its provisions are as follows:—

By clause 1, any water consumer or local authority may complain to the Railway and Canal Commission that any of the Metropolitan Water Companies have failed to perform some statutory duty; and the Commission may hear and determine such complaint. If satisfied as to the failure, they may order the Company within the time limited by the order to fulfil the duty, and may either subject them to any penalty for such failure which can be imposed under any other Act, or enforce the order as they would any other order of the Commission. If at any time complaint as to the quantity or quality of the water supplied by any of the Companies for domestic use is made to the Commission by any consumer or local authority, the Commission may hear and determine such complaint, and if satisfied that it is well founded, may order the Company, within such reasonable time as is specified in the order, to remove the ground thereof, and may enforce such order in the manner generally applicable to their orders. All enactments relating to the Commission (except section 2 of the Railway and Canal Traffic Act, 1894, which restricts the power to award costs) shall, with the necessary modifications, apply to the Commission for the purpose of their jurisdiction under the new Act, which is to be in addition to, and not in substitution for, any existing proceedings or remedy.

According to clause 2, a local authority may aid any water consumer in obtaining the determination of any question which appears to be of interest to consumers with respect to the rights, duties, and liabilities of any of the Metropolitan Water Companies, or otherwise with respect to the supply of water given and the charges made by the Companies; and they may take such legal proceedings as appear necessary or expedient for the protection of the interests of the consumers with respect to these matters.

Clause 3 specifies that the Metropolis Water Acts, 1852 and 1871, shall, as respects the Companies, extend to the whole of the area within which any one of them is authorized to supply water; and for the purpose of these Acts, as so extended, reference to that area is to be substituted for references to "the Metropolis" and "the limits of this Act." As respects any area outside the Administrative County of London, a reference to the council of a county or county borough shall be substituted for a reference to the Metropolitan Authority; and so much of the Acts or of any Local Act as is inconsistent with such substitution shall be repealed.

Clause 4 deals with definitions. It sets forth that, unless the context otherwise requires, the expression "Metropolitan Water Companies" means the Water Companies specified in section 3 of the Metropolis Water Act, 1871. "Water consumer" means any person who is supplied with water by any of the Metropolitan Water Companies, or who pays or is liable to pay any money charged by any of these Companies for or in respect of the supply of water, whether under the name of rent, rate, or otherwise, and includes any householder or owner or occupier of a house entitled to make a communication with the mains or pipes of any of the Companies. "Local authority" means the Council of any county, borough, or district, the Mayor, Alderman, and Commonalty of the City of London, and any Vestry, District Board, or Local Board of Health in the County of London.

LOCAL AUTHORITIES AND THE PAYMENT OF WATER DIVINERS' FEES.

The Expenditure at Ampthill Disallowed.

On Monday, the 17th ult., Mr. W. A. Casson, the District Auditor for the Local Government Board, conducted an audit of the accounts of the Ampthill Urban District Council. The proceedings were interesting because a number of ratepayers had lodged objections against items of expenditure in respect of the employment of a water diviner, and of works executed on his advice. The first set of objections were against the fee of £18 odd paid to Mr. Gataker, the diviner in question, for advice; to the fee of £3 3s. to Dr. Stevenson for analyzing the water; and to £4 8s. paid for boring—the grounds of objection being that public money ought not to be spent in employing a person professing to find water by other than the acknowledged scientific methods, or in undertaking experiments executed upon the advice of such person in the face of reports by the Government Geological Surveyor that attempts to find a good and sufficient supply of water in the parish of Ampthill would be needless. The Auditor also heard the evidence of the Surveyor and other officials, besides that of members of the Council; and it went to show that the Council were entitled to exercise their own judgment, and that the *bona fides* of the diviner was supported by influential testimonials. The Auditor said that if he decided to surcharge the amounts, the District Council would have a right of appeal to either the High Court or the Local Government Board; and it was such an important matter that he should adjourn the audit for the purpose of hearing more evidence.

On the resumption of the proceedings last Wednesday, the Auditor said the question was not so much whether Mr. Gataker could find water at Ampthill as at other places, but whether the Council had exercised reasonable and proper care in expending the fee they had paid to him. The issue was, in fact, whether Mr. Gataker was a competent person for the work required to be done. Mr. H. C. Field and Mr. J. Meek, members of the Council, defended their action in employing Mr. Gataker, who had been influentially recommended. Mr. J. W. Crispe, also a member of the Council, reminded the Auditor that Mr. Gataker had indicated a spring which would yield 2800 gallons a day; and this, on being tested, yielded 3000 gallons. A great deal of similar evidence having been adduced, the Auditor said it seemed to him that the point at issue was that the Council had, in seeking for water, gone to a man who had a reputation for discovering it by some unusual and peculiar method of his own—a method

which he adopted in common with a few other persons. The Council had before them reports from various engineers—some of them containing supplementary reports from Mr. Cameron, the Geological Surveyor for the county; and they all pointed to the existence of water in certain localities. The reasons were given; and the Council could have tested them. They were based on information obtained in a regular manner by observations of the physical features of the country. The Council had these observations before them; but they disregarded them, and engaged Gataker, who discovered water by what was called "divination." The Local Government Board allowed money to be spent for experimental purposes in borings conducted on regular lines. But here they had the case of a man possessing somewhat supernatural powers, or rather claiming to possess them. This being the case, he (the Auditor) could not pass the expenditure which had been incurred in respect of Gataker's fee. He did not think it was suggested that the Council had not done what they considered to be the best and proper thing; but it was urged that they had been misled in seeking the services of a "diviner," and discarding the reports and assistance of those who worked on other methods. The Council were in a position similar to that of trustees; and in spending public money they were bound to act with care and caution. He had looked into the law on the matter. Cases of persons claiming supernatural powers had come before the Courts. In the fortune-telling case of *Regina v. Maria Giles*, the Judge's dictum was that "the pretence to a power, whether moral, physical, or supernatural, is sufficient to constitute an offence within the meaning of the law." He (the Auditor) took it that Gataker did claim to exercise a power beyond that of ordinary mortals; and he did not hesitate to say that, in his opinion, if Gataker had plainly called himself a "water diviner," and charged a fee for divination, the Judge of the Court in which he sought to recover the amount would hold the same doctrine against him as was now put forward. He had therefore no alternative but to surcharge the amount of the payments made to him; but he would pass the fees paid to Dr. Stevenson for analyzing the water, and to Mr. Willsher for boring. The Council could either appeal to the Local Government Board or to the Queen's Bench Division; but to go to the latter would cost money, while an appeal to the Board would not involve any expense. So long as the appeal was pending they were released from responsibility; but when the matter was decided they would either have to pay or the surcharge would be remitted. He ventured to think the latter would be the result. Mr. Field said the Council had applied for borrowing powers on the strength of Gataker's report; and this ruling would, he was afraid, retard the action of the Council in carrying out the water scheme. The Auditor said this was not necessarily so. They could get advice from a properly qualified man.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

"Thank God there is a House of Lords," was once said. Many in Stirling will be so feeling to-day, over the rejection by a House of Lords Committee of the Gas Bill of the Stirling Corporation.* The throwing out of the measure came to me as a surprise; and I understand that their success was matter of astonishment to even the opponents of the Bill. In seeking for the cause of failure, I suppose it will be permissible to venture on the assumption that a House of Lords Committee are not likely to be so jealous of the rights of elected bodies as would be a Committee of the House of Commons. Had the Bill originated in the Lower House, I think it is scarcely likely that the opponents would have obtained *locus* there. Perhaps it is as well that it did not; for if the House of Commons inquiry had been taken first, the House of Lords decision, it is to be presumed, would have been the same as it has been, and thus double expense would have been caused. As to the reason why the Committee allowed the objectors to be heard, all that we know is learned from the remark of Lord Chelmsford, that ratepayers within a municipal boundary are liable in a contingent guarantee rate for any loss which may arise on the gas supply in streets outside the municipal boundary. There is very little force in the suggestion; and it certainly was not sufficient to entitle the objectors to *locus standi*. There are at least two remedies which would be open to a corporation to apply in such a case. They could, first of all, raise the price of gas to the outside consumers; and then they could proceed to bring the outside area within the municipal boundary, so as to make the residents there liable for the assessment. I suppose there is no harm in saying that what probably, as much as anything else, led to the overthrow of the scheme was the unfortunate position in which the Corporation were placed, in respect of Counsel. Their senior Counsel did not appear till after all the evidence had been led; and their second Counsel made a poor opening statement. The case for the promoters was, in fact, not well presented. Then the promoters closed their case sooner than they might have done, in the expectation, I suppose, that they would be able to make something out of the witnesses for the other side, in the way of discrediting the opposition. But in this they were disappointed, because Counsel for the opposition very adroitly led no evidence, and thereby gained the double advantage of preventing senior Counsel for the Corporation addressing the Committee on the evidence, and of saving their own witnesses from being shown up. I use the expression in this sense, that they really had no case to speak to. They were simply citizens of Stirling, and had no knowledge of the value of gas undertakings. They could only say that they disapproved of the acquisition of the gas-works, because they feared it would not be a paying transaction; but they could have led no evidence in support of their view—the evidence was all the other way. The strength of the promoters was thus absent, and the weakness of the opposition was kept out of the view of the Committee. Even these two circumstances combined might not have led to the loss of the Bill; but there was another and more serious drawback to its success. I daresay it could not have been foreseen; but I suppose that now it will not be contradicted that the procedure adopted by the promoters was not that which was likely to commend itself to Parliament. The desire to acquire the gas undertaking amicably was a commendable one. It was for those who were principals in the movement to satisfy themselves whether it could be accomplished or not. They were aware, months ago, of the strength of the opposition; but they went on with the negotiations, even to the length of an informal arbitration to fix the price. I take no exception to the procedure. On the contrary, if there had been no opposition, it was the easiest method by which to acquire the Company's undertaking. But I do fear that parliamentary officials would not view with favour any departure from statutory methods. I can imagine how they would almost receive a shock when they learned that in Stirling they had the temerity to reverse the settled order of things, and were actually asking Parliament to sanction the result of an arbitration, rather than to grant authority for the holding of one. To them the means is everything—the end they have no concern in; and in the matter of the means innovations are undesirable, or at least bothersome. In this light, their opinion would probably be that if the individual gentlemen composing the body of the Town Council believed that they had really the support of the ratepayers, a year's delay was nothing; and that they must just go back to Stirling and proceed in a statutory way. The Bill has, at all events, been lost; and it is greatly to be regretted that it has been. I do not know what is the view of the parties as to the future; but I should think it would be a pity if the subject were allowed to drop. As I have said above, the evidence is all to the effect that a transfer would be a benefit to the community. It would be well if this could be rubbed into the people, so that they might be educated to the extent of taking an intelligent view of the subject, and not be led by men who are not versed in such matters. I would counsel the public men of Stirling to endeavour to come together on the question. A transfer of the gas undertaking is likely to take place some day. If not now, such a favourable opportunity may not occur again, because the Gas Company may be expected to proceed now to strengthen their position. The Company have acted with great fairness and reasonableness throughout the past negotiations. There is no fear of them acting differently in future, unless they be driven to it. Let this be avoided by the moderation of the public men of the town, and there is hope that another effort may be successful.

The "Dundee Courier" of yesterday published the following regarding the Corporation gas undertaking: "The work of going over the accounts of the Gas Department for the past year is now sufficiently far advanced to give an indication of how matters stand. Several accounts have still to be received; but it is apparent that the year will close with a large surplus. This gratifying result is attributable to several causes; the principal being the increased consumption of gas. During the past year, the increased output amounted to as much as 31 million cubic feet. As a matter of course, an increased output such as that mentioned does not mean a relatively increased staff. Hence the reason for the large saving which has been effected. During the past four years, the gas rate has been levied at 3s. 4d. per 1000 cubic feet. But the finances are in so satisfactory a condition at the present time, that it is almost certain the Town Council will be able to reduce the price of the illuminant by 1d. per 1000 cubic feet. At the present time, additions involving a cost of from £4000 to £5000 are going on at the gas-works. The principal part of the new works has reference to increasing the purifying power; but the cost does not affect present expenditure except in the most remote degree, in respect that it is placed to capital." The writer is in error as to the price of gas; for a year ago it was reduced to 3s. 3d. per 1000 cubic feet. It is now proposed to make it 3s. 2d. The Gas Committee met yesterday to consider the accounts for the past year. These showed the revenue to have amounted to £83,722 9s. 1d.; and the expenditure to £82,873 4s. 10d. In the year preceding, the revenue was £81,923 0s. 6d.; and the expenditure, £82,106 13s. For the year now current, the estimates are: Revenue, £84,156 7s. 10d.; and expenditure, £83,524 0s. 3d. With gas at 3s. 2d. per 1000 cubic feet, less 5 per cent. discount for prompt payment, the net price is 3s. The Gas Committee, at their meeting yesterday, resolved, in their Electricity Department, to retain the charge for current at 5d. per unit for the consumption during the first 2½ hours, but to make the charge after that 3½d. per unit.

Councillor Mackenzie, the Convener of the Electric Lighting Committee of the Edinburgh Corporation, has prepared the following statement regarding the income and cost of electric lighting of Edinburgh from May 15, 1896, to May 15, 1897: "The income from private lighting, at 5d. per unit., and from motor power was: Summer term, £3080; winter term, £8418; spring term, £9184—together, £20,682, as against an estimated income of £16,500. The income from arc lighting was £6283, as against an estimated income of £7250; the difference being caused by the late delivery of the arc lamps for the city extensions. The total income was therefore £26,965, as against an estimate of £23,750, or an excess over estimate of £3215. The cost of manufacture, distribution, &c., was £19,200; showing a profit of £7765. The output was 1,102,700 units sold for private lighting and motor power, and 621,260 for arc lighting—a total of 1,723,960 units. The cost has been reduced to 4d. per unit, or, with the discount off, practically 3½d. per unit. The cost per arc lamp for public lighting is now £16. These rates are the lowest charged for electric lighting in the United Kingdom." Upon the principle of giving honour to whom honour is due, I must congratulate Mr. Mackenzie and Professor Kennedy for the excellent results attained in the lighting of Edinburgh by electricity. They have followed the most liberal of courses from the start; and the community have shown their appreciation of this policy by adopting the light.

Mr. J. Hepworth, of Edinburgh, visited Broughty Ferry at the end of last week, and made an inspection of the gas-works, as requested by the Commissioners. The remit to Mr. Hepworth was to report upon: (1) The construction and position of the oil-gas plant; (2) the best means for obtaining additional storage for gas; and (3) generally on the whole plant, and on the propriety of discontinuing the oil-gas plant. Mr. Hepworth's report has not appeared yet; but it is current that he is to recommend considerable changes upon the plant in the works.

The action by Messrs. James M'Kelvie and Co., coalmasters, of Edinburgh, against the Arniston Coal Company, Limited, in which £1250 was sued for as damages for breach of contract (see *ante*, p. 539), was before the Second Division of the Court of Session on Thursday of this week. Lord Low, in the Outer House, it will be remembered, found that the defenders had committed a breach of contract; and he gave decree for £300 and expenses. The defenders took the case to the Inner House. It was put down for hearing this week; but before it was reached, the defenders intimated that they withdrew their reclaiming note. The judgment of Lord Low was accordingly affirmed, with

* A report of the proceedings will be given next week.—Ed. J.G.L.

additional expenses. This makes his Lordship's judgment final. There was every indication that the case would only end in the House of Lords; but the Arniston Company must have felt their position to be untenable. Messrs. M'Kelvie were right in bringing the matters which they complained of to the light of day.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 29.

Sulphate of Ammonia.—There has been a quiet market throughout the week; and prices have been barely steady. Closing quotations are £7 10s. f.o.b. Hull and Leith, and £7 13s. 9d. per ton f.o.b. Liverpool. Home consumption is practically over for the season. For export, however, summer-autumn shipment, there is more disposition to buy. No doubt it is being realized that stocks have been very substantially reduced by increased exports and heavy home consumption, and that we have arrived at the season of small production. "Bear" speculators are less in evidence than they were a few weeks ago.

Nitrate of Soda is a very flat market; there being now sellers of fine quality at 7s. 6d. per cwt. on spot.

LONDON, *May* 29.

Tar Products.—Benzol (which had fallen into a depressed condition, having touched as low as 1s. 4d.) has greatly improved during the past week; and considerable business has been done at prices ranging up to 1s. 8d. Buyers appear to realize that the worst has past, and are now anxious to cover July-December or even July-June at anything like to-day's price. Gas companies are likewise using, and in some instances contracting for, considerable quantities both for prompt and forward. This will have a stimulating effect on the value of benzol. The demand for creosote keeps good; and the value is steadily improving. The higher gravity grease-making oils show a considerable improvement in value, owing to the smaller quantity produced; tar distillers finding it unprofitable to redistil these oils when anthracene is so low in price. This departure will likewise materially reduce the quantity of anthracene produced. Pitch seems lifeless, but has so long remained at its current figure that lower prices are improbable. A considerable number of tar contracts are now in the market, with others following; and competitive prices are being bid, in many cases more than the tar is at present worth.

Prices may be taken as follows: Tar, 14s. to 18s. Pitch, 18s. to 21s., according to port of shipment. Benzol, 90's, 1s. 7d. to 1s. 8d.; 50's, 1s. 10d. to 1s. 11d. Toluol, 1s. 11d. Solvent naphtha, 1s. 6d. Crude, 30 per cent. naphtha, 10d. Creosote, 1¼d.; liquid, 2¼d. Heavy oils, 35s. Carbolic acid, 60's, 1s. 11d. to 2s. 2d. Pressed naphthalene, 62s. 6d. Creosote salts, clothed, 25s. Anthracene, "A," 6d.; "B," 5d.

Sulphate of Ammonia.—Makers can get their production disposed of, but without improvement in price. The tendency, indeed, owing to the further reduction in the value of nitrate of soda, is rather to weakness than otherwise. Market prices are: London, £7 7s. 6d.; Liverpool and West-Coast ports, £7 10s.; Hull and North-East ports, £7 10s.; Leith, £7 11s. 3d., all less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business is beginning to move on perhaps a little more freely in connection with gas coal contracts for the ensuing season; and a good many tenders have been sent in recently. So far as can be gathered, these are in most cases based pretty nearly upon last year's rates, with a tendency to stiffen up slightly for special qualities. The average quotations which have gone in would seem to range from about 6s. 3d. to 6s. 6d. per ton at the pit for the common Wigan four-feet class of gas coals, and 6s. 9d. up to 7s. 3d. for Arley gas coals. These are much about the figures that were obtained last year. For steam and forge coals, there are moderate requirements; but the demand is not sufficient to take away the output offering in the market, and prices continue very low. Engine fuel is in active request; and supplies are not by any means over plentiful. But colliery proprietors are finding it difficult to secure any advance upon late rates. Some slight increase has here and there been secured on forward contracts; but for current sales in the open market, the average prices are unchanged. At the pit mouth, best Wigan Arley scarcely averages above 10s. per ton, and might be bought at 9s. 6d.; seconds Arley and Pemberton four-feet, 8s. to 8s. 6d.; steam and forge coals, 5s. 9d. to 6s. 3d.; engine fuel, 3s. 3d. to 3s. 6d. for common, to 3s. 9d. to 4s. 3d. for medium sorts, and 4s. 6d. to 5s. for best qualities. The shipping trade continues in a very quiet condition, with prices of steam coal remaining at about 7s. 6d. to 7s. 9d. per ton delivered at the Mersey ports.

Northern Coal Trade.—The coal trade has been irregular of late; but in the last few days it has been rather improved in extent. The shipments are heavy; and there is a large local demand for most kinds of fuel. Best Northumbrian steam coals are steady; the exports to the Baltic being now very full. The price generally quoted is 8s. 6d. per ton f.o.b.; second-class coals, 8s.; and steam smalls, 3s. 6d. to 3s. 9d. The gas coal trade is quiet. The local demand is about at its lowest point; but some collieries are well employed on orders for export. Prices of best Durham gas coals vary from 6s. 9d. to 7s. 3d. per ton f.o.b, though one or two collieries ask still higher prices. The tenders have been sent in for the supply for the Sunderland Gas-Works; and those for the Tynemouth works will be soon in. It is expected that prices will be equivalent to about 6s. 9d. per ton f.o b. Gas coke is unaltered in price; but the production is rather lower this week, and stocks, as a consequence, tend downwards.

Scotch Coal Trade.—The volume of trade continues large. No difficulty is experienced in disposing of very extensive outputs. Ell coal is in much demand for export; and the prices are, if anything, a shade firmer. Splint is not in such good demand, and is scarcely so firm in price. Main is in request, at unchanged rates. The quotations are: Main, 6s. 6d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; and splint, 6s. 6d. to 7s. The shipments for the week amounted to 156,127 tons—an increase upon the preceding week of 3770 tons, but a decrease as compared with the corresponding week of last year of 11,520 tons. For the year to date, the total shipments have been 2,795,579 tons—an increase over the same period of last year of 94,539 tons.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 1236).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	9 Apl.	10½	Alliance & Dublin 10 p. c.	23–25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	108–111	..	4 10 11
200,000	10	27 May	7	Belgrano (B. Ayres), Limited	9½–10*	..	7 0 0
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	104–107	..	4 13 5
200,000	5	27 May	6½	Bombay, Limited	6½–7*	..	4 5 9
40,000	5	,,	6½	Do. New, £4 paid	5¼–5⅜*	..	4 10 7
380,000	Stck.	26 Feb.	12	Brentford Consolidated	297–303	+10	5 19 7
240,000	,,	,,	9	Do. New	223–228	..	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	145–150	..	3 6 8
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	25 Mar.	11½	Brighton & Hove Original	273–278	..	4 2 8
208,820	,,	,,	8½	Do. A Ord. Stk.	197–202	..	4 4 2
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	130–135	..	3 14 1
420,000	20	26 Mar.	11½	British	56–57	..	3 18 11
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23–25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18–20	..	4 5 0
500,000	10	28 Apl.	6	Buenos Ayres (New) Limited	9¾–10¼	+¼	5 17 1
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101–103	..	5 16 6
150,000	20	26 Feb.	8½	Cagliari, Limited	30–32	..	5 3 1
100,000	10	30 Sept.	8½	Cape Town & District, Ltd	17–18	..	4 8 11
50,000	50	3 May	6	Do. 6 p. c. 1st Mort.	57–59	..	5 1 8
550,000	Stck.	9 Apl.	13¾	Commercial Old Stock	340–345‡	..	3 18 3
165,000	,,	,,	10½	Do. New do.	255–260‡	..	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150–155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	255–260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,600	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c.	317–322	..	4 6 11
163,400	,,	,,	11	Do. B 7 p. c.	255–260	..	4 4 7
535,000	Stck.	26 Feb.	5½	Crystal Palace Ord. 5 p. c. Stk	139–142	..	3 13 11
60,000	,,	,,	5	Do. 5 p. c. Pref.	140–143	..	3 9 11
486,090	10	29 Jan.	11	European, Limited	24½–25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,836,590	Stck.	12 Feb.	12¾	Gaslight & Coke, A, Ordinary	312–317	+1	4 0 5
100,000	,,	,,	4	Do. B, 4 p. c. max.	112–117	..	3 8 5
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	312–317	..	3 3 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150–155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	220–225	..	3 6 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	312–317	..	3 3 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182–187	..	3 4 2
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	140–143	..	2 15 11
294,850	,,	,,	4½	Do. 4½ p. c. do.	152–157	..	2 17 4
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	13 May	6	Hongkong & China, Limited	13–14	..	4 5 10
					‡ Ex new.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d
3,800,000	Stck.	13 May	10	Imperial Continental	212–217	..	4 12 2
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	106–103	..	3 17 8
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk ,,	104–107	..	3 5 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5¾–6¼	..	4 16 2
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	111–113	..	4 8 6
250,000	100	,,	4½	Do. 4½ p. c. Debs.	107–109	..	4 2 7
541,920	20	12 Nov.	5	Monte Video, Limited	14½–15½	..	6 9 0
150,000	5	27 May	8	Oriental, Limited	8⅛–8⅜*	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7¼–7⅜*	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1⅜–1½*	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	3 May	6	People's Gas } 1st Mtg. Bds.	104–109	..	5 10 1
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	107–112	..	5 7 1
250,000	10	27 May	10	San Paulo, Limited	14–15*	..	6 13 4
5,475,000	Stck.	26 Feb.	5½	South Metrop., 4 p.c. Ord.	141–144	..	3 12 11
1,416,667	,,	—	3	Do. 3 p.c. Deb. Stk.	106–108	..	2 15 7
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	275–285	..	4 0 10
60,000	,,	,,	8½	Do. B	190–200	..	4 5 0
182,380	10	27 May	10	Tuscan, Limited.	13½–14½*	..	6 18 0
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101–103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	330–335	+3	3 2 8
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158–162	..	2 15 6
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160–165	..	2 14 6
1,720,560	Stck.	9 Apl.	7	East London, Ordinary	221–225	..	3 2 9
554,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	164–169	..	2 13 4
390,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	107–109	..	2 15 0
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	118–123	..	3 1 0
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148–153	..	2 12 4
708,000	Stck.	12 Feb.	12	Kent	342–347	..	3 9 2
160,000	,,	,,	7	Do. New, 7 p. c. max.	212–217	..	3 4 6
1,043,800	100	30 Dec.	9½†	Lambeth, 10 p. c. max.	282–287	+2	3 7 10
406,200	100	,,	7½	Do. 7½ p. c. max.	220–225	..	3 6 8
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147–150	..	2 13 4
500,000	100	12 Feb.	13	New River, New Shares.	423–428	+1	3 0 8
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	152–155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	157–162	+2	3 14 1
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150–155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 7
1,019,585	,,	9 Apl.	4	Do. 4 p. c. A Deb. Stk.	145–148	..	2 14 2
1,155,066	Stck.	11 Dec.	10	West Middlesex	310–315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7
† Next Dividend will be at this rate.					*Ex div.		

Ledbury Water Scheme.—At last week's meeting of the Ledbury District Council, a communication was read from the Local Government Board, authorizing a loan of £5000 for the provision of a new water supply; but leaving to the Council the responsibility of carrying out the scheme.

"Diamond Jubilee" Expenses.—The Local Government Board have issued two orders, one of which sanctions any reasonable expenses which may be incurred by County Councils, Urban District Councils (not being the councils of boroughs), or Rural District Councils, in the preparation of any address to the Queen or otherwise in connection with the public celebration of the sixtieth anniversary of Her Majesty's accession.

Malta and Mediterranean Gas Company, Limited.—At the meeting of this Company on the 15th inst., the Directors will report that for the twelve months ended March 31 the profits compare favourably with those of the preceding year. In December last an installation of the electric light was completed and brought into operation in Malta by the local Government. A decrease in the public rental has consequently taken place; but, on the other hand, there has been an increase in that from private consumers. The Directors recommend the usual dividends on the first and second preference capital, and a dividend of 4 per cent. upon the ordinary capital; making, with the interim dividend of 2 per cent. paid in December last, 6 per cent. for the year, and leaving a balance of £1698 to be carried forward.

The Proposed Railway Siding for the Coventry Gas-Works.—It may be remembered that the Coventry City Council recently referred to the Gas Committee the question as to the desirability of constructing a siding from the Nuneaton line of the L. & N. W. Railway to the gas-works. The Committee reported, at last Tuesday's meeting of the Council, that, as the borrowing powers conferred upon the Corporation by the Gas Purchase Act of 1884 are exhausted, the suggested siding could not be constructed without fresh powers; and they therefore proposed to consider the question in connection with the application which it is intended to make to Parliament next year for powers for the construction of auxiliary works. The report was adopted.

New Joint-Stock Companies.—The following joint-stock companies have lately been registered: South-Eastern Coal Exploration Company, Limited, with a capital of £100,000, in £1 shares (50,000 deferred), to acquire and work coal mines in Kent and elsewhere, and to carry on business as electricians, mechanical engineers, suppliers of electricity, manufacturers of, and dealers in, cables, wires, lines, accumulators, lamps, machinery, appliances, &c. The Somzée-Greyson Intensified Gas-Light Syndicate, Limited, with a capital of £25,000 in £1 shares, to adopt an agreement with Paul Greyson de Schodt and La Société Anonyme d'Eclairage et de Chauffage Intensifs of Brussels, and to manufacture, sell, and deal in appliances for use in conjunction with gas and incandescence. John Ruscoe and Co., Limited, with a capital of £10,000, in £1 shares, to acquire the business now conducted by Mr. Ruscoe at Hyde, and to carry on business as ironfounders, mechanical engineers, and manufacturers of agricultural and other machinery.

New Water-Works Scheme at Margate.—The Margate Town Council have resolved to have a deep boring made in the Dane, in order to ascertain if there is a sufficient supply of pure water in the lower strata to meet the requirements of the town; it now being an open secret that the analyses of the Wingham water are not such as to justify the Council in going to an expenditure of £50,000 to provide a supply from that quarter. The experiment at the Dane is estimated to cost £1000.

The New Water Scheme for Eastbourne.—The Eastbourne Water Company have lost no time in seeking to fulfil the pledge given on their behalf to the Committee of the House of Lords with respect to the new supply of water from Friston. Before the Company's Bill had passed the third reading in the House, Sir Frederick Bramwell had visited Eastbourne, and made his inspection. Acting upon his report, the Directors of the Company have placed a contract with Messrs. John Aird and Sons for the construction of the necessary works; so that the water from this new source will, it is hoped, be available by August next.

Hebden Bridge Gas Supply.—An extraordinary meeting of the Hebden Bridge Urban District Council has been held for the purpose of receiving and adopting the report and accounts of the Hebden Bridge and Mytholmroyd Gas Board for the sixteen months ending March 31. The report on the past twelve months showed a profit of £3662, which, after paying dividends on stock and interest on mortgages, and setting aside £973 for the sinking fund, left a balance of £364, which will be carried forward to next year's accounts. The coal carbonized was 5640 tons; and the gas made, 60,260,000 cubic feet, representing 10,682 feet per ton of coal. The report was adopted.

Portsmouth Water Company.—The half-yearly general meeting of this Company was held on Thursday—Mr. W. Grant, J.P., in the chair. The Directors' report, already noticed in the "JOURNAL" (*ante*, p. 1204), having been taken as read, the Chairman moved its adoption. Referring to the retirement of Mr. R. W. Ford from the secretaryship, to which allusion has been made in our columns, he said Mr. Ford had seen nearly half-a-century's service with the Company; and the Board were unanimous in recommending that, under these exceptional circumstances, he should be allowed a pension to the full amount of his salary. Mr. Ford desired him to convey to the shareholders his thanks for the consideration he had always received at their hands. With regard to Mr. Wilkinson, who had been appointed Mr. Ford's successor, he had been a quarter of a century in the service; and all connected with the undertaking could testify to the marked ability and industry he had brought to bear in the discharge of his duties. Having briefly alluded to the approaching completion of the works in connection with the diversion of the Hermitage stream, and to the decision of the Board to construct cooling-ponds at the Havant works, the Chairman mentioned that the Company were threatened with a considerable increase in the assessment of their properties, and would take every step to protest against anything they thought unfair. The report was adopted; as was also a special resolution confirming the pension to Mr. Ford and the appointment of Mr. Wilkinson.

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	Daily Capacity in Cub. Ft.
BLACKBURN	1,250,000
COLCHESTER	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000
BIRKENHEAD	2,250,000
SWINDON (NEW SWINDON GAS COMPANY)	125,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000

TORONTO, One New Set, and Four Double Superheater Settings improved.
MONTREAL, Two New Sets, and other parts of Plant.
OTTAWA, Two New Sets.
BELLEVILLE, One "Springer" Setting Remodelled with "M-W-P" Patents.
PETERBOROUGH, One Set and Remodelled Works.
LINDSAY, Remodelled Plant.
BRANTFORD, Added Improvements to existing Setting.
ST. CATHERINES, do. do.
KINGSTON, U.S.A., One New Set, and other parts of Works, including New Purifiers and Gasholder.
WILKESBARRE, U.S.A., Two New Sets, and other parts of Plant.

N.B.—The M.-W.-P. Plant is built under penalty to Manufacture Gas on less Raw Material than any other Plant on the Market.

All Enquiries to be Addressed to the Company's Offices.

Oldham Corporation Water Supply.—At the meeting of the Water Committee of the Oldham Corporation on the 19th ult., the Water-Works Superintendent (Mr. A. Andrew) submitted his financial statement of the past year's working. He reported that the expenditure on capital account for the twelve months ending March 25 last amounted to £24,710, less £584 for land and material sold at Castleshaw. The gross revenue on the water-works account amounted to £57,161; and the gross expenditure, to £17,978—leaving a balance of £39,183 to be carried to profit and loss account. After liquidating the annual charges, the debit balance has been reduced to £601. The income on the water-works revenue account was £57,161, against £55,869 in the previous year. The water-rental, including meter hire, was £55,893, against £54,590—an increase of £1303. The expenditure on revenue account was £17,978, against £22,029. The number of houses supplied with water is 45,758; being an increase of 574 during the year. The length of water-mains laid in extensions, enlargements, and renewals has been 7272 yards; and 1432 yards of mains have been taken up.

Heywood Corporation Gas Supply.—In the "Journal" for the 18th ult. (p. 1140), we gave the financial results of the working of the Gas Department of the Heywood Corporation during the year ending the 31st of March. We learn from the report of the Manager (Mr. W. Whatmough) that during the year, 345 tons of cannel and 10,456 tons of coal were carbonized—a total of 10,801 tons, or 630 tons less than in 1895-6. The quantity of gas produced was 110,341,000 cubic feet; being a falling off to the extent of 443,000 cubic feet as compared with the preceding twelve months. The total amount sold, however, was 101,216,961 cubic feet - an increase of 894,224 cubic feet. The quantity of gas not accounted for was 7,843,139 cubic feet, against 9,462,000 cubic feet, representing a leakage of 7·17 per cent., as compared with 8·54 per cent. for 1895-6 and 10·35 per cent. for 1894-5, or a saving of 1,618,924 cubic feet, which at 3s. per 1000 feet amounts to £242. There was an increase of 147 meters, 77 gas-stoves on hire, 321 grillers and burners on hire, 8 gas-engines, and 13 prepayment meters. Mr. Whatmough says the demand for stoves and grillers last year was exceptional; the total now in use being 1312—an increase of 49.

Conway and Colwyn Bay Water Board.—An extraordinary financial transaction has come to light in connection with the above Board. Dr. R. A. Prichard, the Mayor of Conway, has been elected Chairman for the ensuing year; and one of his first duties was to announce to the members that a cheque for £1000, the payment of which to a contractor had been definitely postponed at a previous meeting to await the award of an arbitrator, had been signed by one of the members of the Board and another gentleman who was no longer a member. It appeared that, in order not to delay certain work, the Rev. W. Venables Williams, then the Chairman of the Board, and another gentleman gave, some time since, their private guarantee to the contractor for the cost. It transpired, in the course of the somewhat confused discussion which followed Dr. Prichard's announcement, that the signatories of the cheque were the Rev. W. Venables Williams, and Mr. John Roberts, J.P., the Chairman of the Colwyn Bay District Council; that the cheque was signed on May 8, whereas the Clerk a week previously had received notice of the election of a new member in place of the Rev. W. V. Williams; and that consequently the latter signed the cheque (which is paid, and debited to the Colwyn Board) when, as a matter of fact, he was not a member. No decision was passed on the subject; but where the matter will end is not clear.

Staffordshire Potteries Water-Works Company.—The annual meeting of this Company was held at Hanley last Thursday; Mr. J. F. Wileman presiding. In their report, the Directors stated that the water revenue for the year amounted to £40,665, against £38,371 for the previous year; showing an increase of £2294. The available balance on the profit and loss account was £19,712, which with £302 brought forward from the last account, made a total of £20,014. After deducting the interim dividend a balance of £11,314 remained. Out of this the Directors recommended a dividend of 6 per cent. for the year, including the interim dividend, which would leave a balance of £2465, from which it was proposed to transfer £1367 to the contingent reserve fund; making it £10,000, and leaving £1097 to be carried forward. The demands of the district for additional water were, it was stated, steadily increasing; and it had therefore been decided to enlarge the works at Hatton. During the year, extensions had been carried out for the supply of Madeley and Leycett, which had involved the laying down of about five miles of mains, and the construction of two small service reservoirs and two break-pressure tanks. In moving the adoption of the report, the Chairman congratulated the proprietors upon the favourable working of the year; remarking that they had not only been able to declare the usual dividend, but to hand over a surplus to the reserve fund and next year's account. The motion was unanimously agreed to.

Messrs. W. Parkinson and Co. held a very successful gas exhibition from Tuesday to Friday last week in the Town Hall, Dunstable. Miss Edith Sanderson gave practical demonstrations in cookery twice daily.

The Wexford Gas Company have decided to adopt the regenerator system of heating retorts, on Mr. W. R. Chester's plan; and the work has been placed for execution in the hands of Messrs. R. Dempster and Sons, Limited, of Elland.

An exhibition of the gas cooking and heating appliances manufactured by Messrs. Richmond and Co., Limited, was commenced at Southport yesterday week, and will be continued until next Friday. The cookery lectures are being delivered by Miss Lillie Richmond.

From the 19th to the 29th ult., Messrs. R. and A. Main held, under the auspices of the Chesterfield Gas and Water Board, an exhibition of their gas-stoves, the efficiency of which for culinary operations was demonstrated by Miss Chester, of the Nottingham School of Cookery.

A gas exhibition jointly arranged by Messrs. John Wright and Co., Limited, and the Davis Gas-Stove Company, Limited, was held at Canterbury last week under the auspices of the Gas and Water Company. An attractive cookery programme was explained daily by Miss Ball.

The Skipton Gas Company, acting on the advice of their Manager (Mr. W. H. Burtonshaw), have just taken the initial steps towards the erecting and fitting up of a new retort-house, with regenerative settings. A set of annular condensers, having a capacity up to 200 million cubic feet per annum, are now almost ready for work. Considerable extensions of mains, &c., are also in contemplation.

During the latter part of last week, Messrs. John Wright and Co., Limited, held an exhibition of their gas stoves and other appliances in the Albert Institute, Windsor. The cookery demonstrator was Mrs. C. F. Pitcher, who, on Thursday evening, by the aid of one of the "Eureka" cookers, prepared a splendid dinner with a consumption of 26 cubic feet of gas, which, at the price charged in Windsor (3s. 4d.), costs 1d.

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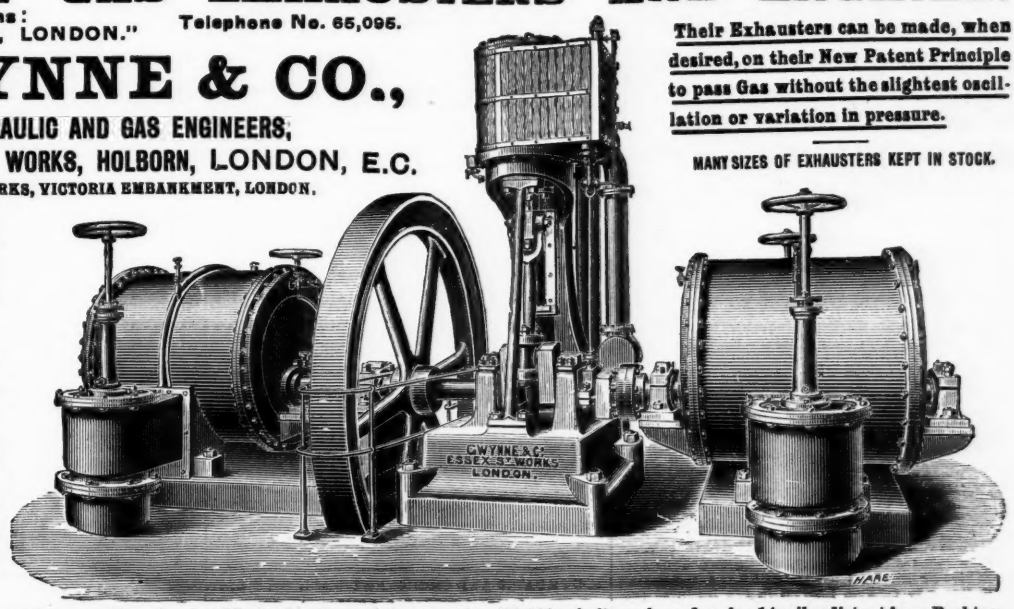
Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.



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Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

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NOTICE TO ADVERTISERS.—In consequence of the WHITSUN HOLIDAY, orders with respect to ADVERTISEMENTS should be received at the Office *not later* than THE FIRST POST ON SATURDAY NEXT.

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ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. in use in most Continental Gas-Works, and in more than 300 British Gas-Works.
ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.
Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR wanted.
BROTHERTON AND Co., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND Co., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TUBES for Gas, Steam, and Water (all Sizes), Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 1214, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ENGAGEMENT wanted as Traveller in the Iron or Coal Trade by a German, who is able to speak and correspond in English, French, Spanish, and German. First-class English and German References.
Apply to H. Q. 393, care of Haasenstein and Vogler A.G., HAMBURG.

SON of Manager (age 30) seeks a Situation as GAS-FITTER. Well up in Iron and Compo. work, fixing Meters, Cookers, and Fires, Main and Service laying, Incandescent Street Lighting, and the general routine of a Gas-Works. Good References if required.
Address No. 2850, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER (Son of a Gas Manager) desires a Situation as SECRETARY and MANAGER or MANAGER of Gas or Water Works. Experienced in both. Holds Certificates for Chemistry and Honours Grade Gas Manufacture. First-Class Testimonials and References.
For further Particulars, apply to No. 2857, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a Stoker in small Country Works (one used to all kinds of work). Constant employment. Wages 19s. in Summer; 21s. in Winter.
Apply to the MANAGER, Gas-Works, West Malling, KENT.

A GENTLEMAN and Engineer, well connected, wanted to REPRESENT a firm of CONTRACTING GAS ENGINEERS. A Gentleman with Money to take an interest in the Business preferred. State Age, Experience, and Salary.
Address Box 1522, Sell's Advertising Offices, FLEET STREET, E.C.

A FIRM of Contracting Gas Engineers wish to engage a gentleman to REPRESENT them. Applicants must be thoroughly conversant with details of Gas Apparatus, to enable them to advise and take Dimensions when required.
State Age, Experience, and Salary, to No. 2855, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see p. 1271.]

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

ALEX. P. KER, C.E., Consulting Gas Engineer, Hunton Road, Grave'ly Hill, Birmingham, 25 Years Assistant Engineer and Manager of Works to the Corporation of Birmingham and their predecessors, MAY BE CONSULTED on all matters connected with GAS ENGINEERING, including Valuations, Alterations, Additions and Extensions, &c. REPORTS upon EXISTING WORKS and IN PROGRESS. EXAMINATIONS OF GAS for ILLUMINATING POWER and IMPURITIES conducted. Plans, Specifications, and Estimates prepared.

CLEETHORPES GAS COMPANY.

WANTED, at once, a Collector (married) to live at Branch Office. Must be a thoroughly good Bookkeeper, and used to Gas Company's Accounts.
E. J. BROCKWAY,
Engineer and General Manager.

CONTRACTOR requires a good leading DRAUGHTSMAN, accustomed to designing and detailing Gas Apparatus or Retort-Settings.
Apply, stating Age, Experience, and Salary required, to No. 2854, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS-FITTERS.

WANTED, at once, a Gas-Fitter capable of laying Mains and Service-Pipes and Inspecting Meters.
Apply, stating Age and Wages required, and enclosing *copies* of Testimonials (which will not be returned), to T. LAYTON, Manager, Gas-Works, REDDITCH.

WORKING Manager wanted for small Gas-Works within 32 miles of London; make 3½ million feet annually. Man to assist. Must take Meters. Only steady man need apply. State whether Mechanic, Age, Experience, and References. House, Garden, Firing, and 25s. weekly Wage.
Apply, by letter, to No. 2860, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN.

WANTED, a thoroughly competent DRAUGHTSMAN in a large Gas-Works in Scotland. One accustomed to structural Ironwork and Gas-Works Plant. Quick at detailed Drawings, and the estimation of quantities. Salary, £2 per week.
Apply, by letter, stating Age and Experience, enclosing not more than three *copies* of recent Testimonials, to No. 2851, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SOUTHBANK AND NORMANBY GASLIGHT AND COKE COMPANY, LIMITED.

WANTED, a Competent Man as Fitter, METER INSPECTOR, and REPAIRER, to do Smithing and general Repairs of Works, and to make himself generally useful. Must have a good character for Sobriety and Competency. To a suitable Man, the appointment would be a permanency, and liberal wages given.
Apply, with two recent Testimonials, stating Wages required, to WILLIAM NIXON, Secretary and Manager, Gas-Works, Southbank, R.S.O., YORKS.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

TO GAS AND WATER OFFICIALS.

SPECIAL and Favourable Terms for CYCLES are offered. The very best "up-to-date" Cycle at a reasonable Cost. "Dunlop" Tyres, Weldless Tube throughout, "Westwood" Rims, "Brook's" Saddle, "Perry's" or "Renold's" Chain, &c. The whole combining to make as fine a Machine as is possible to be made. Satisfaction guaranteed. Send at once for Catalogue post free.
MELROSE CYCLE COMPANY, COVENTRY.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two or Four Second-hand PURIFIERS, 12 feet square.
Write, with Particulars and Price, to No. 2856, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the following Second-hand GAS PLANT. Must be in good Condition.
Three PURIFIERS, 8 ft. by 6 ft., with Centre-Valve and 6-inch Connections.
One 6-inch PIPE CONDENSER, with Valves complete.
One STATION METER, to pass 5000 cubic feet per hour, with 6-inch Connections and Valves.
Offers to No. 2858, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two Purifiers, with necessary Lifting Apparatus, Valves, Screens, &c., complete.
One SCRUBBER, filled with Boards,
One BATTERY CONDENSER.
Either new or second-hand, suitable for small private Gas-Works, working four Iron Retorts in Summer, and nine in Winter. To be fixed complete. Neighbourhood of Trent, Derbyshire.
Address No. 2859, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Round Station Meter (by Milne), 7-inch Connections and Bye-Pass Valve; 7000 cubic feet per hour. In good order. Being replaced by a larger one.
Apply to the Gas-Works, MUSSELBURGH.

GAS PLANT for Sale—
TOWER SCRUBBER, 30 feet high and 5 feet diameter, with 10-inch Connections and Four-Way Valve. Filled with Boards.
STATION METER for 8000 Cubic Feet per hour, with 10-inch Bye-Pass and Connections.
Eighteen RETORT MOUTHPIECES, 21 in. by 15 in. ⌂, 6-inch Outlets, complete with Bridles, Lugs, and Lids.
ASCENSION-PIPES, 6 inch to 5 inch taper, and 5-inch H-PIPES.
WROUGHT-IRON HYDRAULIC MAIN, with Six Dip-Pipes and Valve, and one spare 6-inch square Bridge Valve.
The above are in first-rate condition.
Apply to G. W. LUPTON, Gas-Works, Otley, YORKS.

FOR SALE—A Station Meter complete, in thorough working order. Recently overhauled and certified correct by Messrs. Braddock. Capacity, 50,000 feet per hour.
Apply to JOHN H. DARBY, Brymbo, near WREXHAM.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60,000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the purchase of about 7200 Tons of TAR and 2,500,000 Gallons of AMMONIACAL LIQUOR, to be produced at their different Works during One Year, commencing the 1st of July next.
Specification and Form of Tender may be obtained from Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom tenders are to be sent on or before Tuesday, June 8, 1897.

A. NICHOLSON,
Town Clerk.

Oldham, May 18, 1897.

THE Accrington District Gas and Water Board invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR which may be produced at their Accrington and Great Harwood Works during the Year from the 30th of June to the 30th of June, 1898.
Coal Carbonized at Accrington, 16,400 Tons.
Do. Great Harwood, 11,200 ,,
Tenders, endorsed, to be sent to A. H. Aitken, Esq., Clerk to the Board, on or before Thursday, the 3rd of June.
Particulars can be obtained from the undersigned.

CHAS. HARRISON,
General Manager.

SMETHWICK GAS-WORKS.

TENDERS FOR GAS COAL AND LIME.

THE Gas Committee of the Urban Dis- trict Council of Smethwick invite TENDERS for the supply of about 25,000 Tons of GAS COAL for delivery over the Year ending the 30th of June, 1898.
Forms of Tender may be obtained from the undersigned.
Tenders are also invited for the supply of about 300 Tons of Purifying LIME during the same period.
Sealed tenders, endorsed "Tender for Gas Coal," or "Lime," (as the case may be), and accompanied, if possible, by an Analysis, to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned on or before June 15, 1897.

By order,
W. J. STURGES,
Secretary.

Public Buildings, Smethwick,
May 29, 1897.

SMETHWICK GAS-WORKS.

CARBURETTING OIL.

THE Gas Committee invite Tenders for the supply of their requirements during the Year ending the 30th of June, 1898, of CARBURETTING OIL, 700 Specific Gravity, delivered in Barrels at the Gas-Works, Rabone Lane, Smethwick.
Tenders, addressed to the Chairman, and endorsed "Tender for Oil," to be delivered to the undersigned not later than the 15th of June, 1897.
The Committee do not bind themselves to accept the lowest or any tender.

By order,
W. J. STURGES,
Secretary.

Public Buildings, Smethwick,
May 29, 1897.

BARKING GAS COMPANY.

TO BUILDERS AND CONTRACTORS.

CONTRACT NO. 1.

THE Directors of this Company invite TENDERS for the erection of a New RETORT-HOUSE (83 ft. long by 60 ft. wide inside measure), a BOILER-HOUSE, EXHAUSTER HOUSE, and MESS-ROOM on their Premises at Barking, Essex.
Drawings and Specification may be seen at the Company's Office, 55, High Holborn, London, or on application to Mr. W. North, at the Gas-Works, Stourbridge, on and after Thursday, June 3, 1897.
Sealed tenders, endorsed "Tender for Retort-House," and addressed to the Secretary of the Barking Gas Company, 55, High Holborn, London, must be sent in on or before Thursday, June 17, 1897.

STURT MORRIS,
Secretary.

55, High Holborn, London, W.C.,
May 27, 1897.

BARKING GAS COMPANY.

TO WROUGHT-IRON ROOF MAKERS.

CONTRACT NO. 2.

THE Directors invite Tenders for a new WROUGHT-IRON ROOF to cover their new Retort-House, to be erected on their Premises at Barking, Essex. The Retort-House will be 83 ft. long by 60 ft. wide inside measure.
Drawings and Specification may be seen at the Company's Office, 55, High Holborn, London, or on application to Mr. W. North, at the Gas-Works, Stourbridge, on and after Thursday, June 3, 1897.
Sealed tenders, endorsed "Tender for Iron Roof," and addressed to the Secretary of the Barking Gas Company, 55, High Holborn, London, must be sent in on or before Thursday, the 17th day of June, 1897.

STURT MORRIS,
Secretary.

55, High Holborn, London, W.C.,
May 27, 1897.

THE INCORPORATED

Gas Institute.

THE THIRTY-FOURTH

ANNUAL GENERAL MEETING

OF THE MEMBERS

WILL BE HELD ON

Tuesday, Wednesday, and Thursday,

the 15th, 16th, and 17th of June, 1897,

AT THE

GUILDHALL, BATH.

THE CHAIR WILL BE TAKEN BY THE PRESIDENT,

C. STAFFORD ELLERY, Esq.

The Proceedings on Tuesday commence at 11 a.m., when a welcome will be extended by his Worship the Mayor of Bath, George Woodiwiss, Esq., J.P. On Wednesday and Thursday, the chair will be taken at 10 a.m.

On Friday, June 18, there will be an Excursion by brake to Longleat Park, the seat of the Marquess of Bath.

THE BENEVOLENT FUND.

The Annual General Meeting of the Donors and Subscribers to the Benevolent Fund will be held on Tuesday, June 15, at the close of the sitting, about 4.30 p.m.

WALTER T. DUNN, Secretary.

13, *Victoria Street, Westminster S.W.*

NEWARK GAS COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Com- pany are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, free on Rail G.N.R. or M.R., in Purchaser's Tanks, for One Year from the 1st day of July, 1897.
Terms: Cash monthly.
Further Particulars can be obtained on application to the undersigned, to whom sealed tenders are to be sent on or before the 16th day of June next, marked on the outside "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.

By order,
F. B. FOOTTIT,
Secretary.

Newark, May 28, 1897.

NEWARK GAS COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Works for One Year from the 1st day of July, 1897, at per degree Twaddel (Temperature 60° Fahr.). The Liquor to be not less than 5° in strength.
Terms: Cash monthly.
Further Particulars can be had on application to the undersigned, to whom sealed tenders, marked on the outside "Tender for Liquor," are to be sent on or before the 16th day of June next.
The highest tender will not be necessarily accepted.

F. B. FOOTTIT,
Secretary.

Newark, May 28, 1897.

BOROUGH OF DONCASTER.

TENDERS FOR COAL.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the supply of 18,000 Tons of best GAS COAL, during a period commencing July, 1897, and terminating June 30, 1898, or as may be afterwards arranged.
Particulars and Tender Forms may be obtained on application to the undersigned.
Tenders should be sent, under seal, to John Athron, Esq., the Chairman, endorsed "Tender for Coal," not later than Ten a.m., on Wednesday, the 9th of June next.
By order of the Gas Committee, who do not bind themselves to accept the lowest or any tender.

RT. BRIDGE,
Engineer.

Gas-Works, Doncaster,
May 18, 1897.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee are prepared to receive sealed TENDERS for the supply of GAS COAL, including carriage to the Bridgnorth Railway Station, for One Year from or soon after the end of July next.
Evidence as to the quality of the Coal must accompany each Tender.
Quantity required: About 2200 Tons per annum in proportionate deliveries as directed—say, 70 per cent. during Winter Months, and 30 per cent. during Summer Months.
Sealed and marked tenders must be sent to the undersigned not later than Saturday, the 12th of June.
The Committee do not bind themselves to accept the lowest or any tender.

By order,
J. H. COOKSEY, Town Clerk,
Secretary.

Bridgnorth, May 26, 1897.

CORRUGATED IRON ROOF.

THE Salisbury Gas Company are open to receive TENDERS for the supply and erection of a CORRUGATED IRON ROOF, about 70 feet span and 50 feet long.
Drawings and Specification may be inspected on application to the Engineer, Mr. N. H. Humphrys, Gas-Works, Salisbury.
Tenders must be delivered on or before June 15.

BOROUGH OF ABERAVON

THE Corporation are prepared to receive TENDERS for 200 Tons — more or less — of CANNEL COAL (which must yield good saleable Coke) for One Year from the 1st of July next; to be delivered at the Port Talbot or Aberavon Stations in such quantities as required by the Manager.
Tenders (with analysis of Cannel enclosed), marked "Tender for Cannel," to be sent to me on or before the 12th of June.
The Corporation do not bind themselves to accept the lowest or any tender.

By order,
M. TENNANT,
Town Clerk.

Aberavon, May 29, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

ROOF OVER COAL-STORE.

TO ROOF MANUFACTURERS & CONTRACTORS.

THE Directors of this Company invite TENDERS for the supply and erection of a Corrugated IRON ROOF, with Columns, Girders, and Cast-Iron Guttering, for Coal-Store at their Grimesthorpe Station.
The Roof is 415 feet long by 70 feet span.
Drawings may be seen, and Specification with Bill of Quantities and Form of Tender obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bond-fide* tender.
Sealed tenders, endorsed "Tender for Roof," must be delivered (by post) to the undersigned at the Company's Offices not later than the first post on Saturday, the 5th day of June.
The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
May 17, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO GAS EXHAUSTER MANUFACTURERS.

THE Directors of this Company invite TENDERS for the supply and erection at their Grimesthorpe Station of two pairs of TWIN EXHAUSTERS, with Vertical Steam-Engines; each pair to be capable of passing 125,000 Cubic Feet of Gas per hour.
Particulars, with Form of Tender, may be obtained on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bond-fide* tender.
Sealed tenders, endorsed "Tender for Exhausters," must be delivered (by post) to the undersigned at the Company's Offices not later than the first post on Saturday, the 5th day of June, 1897.
The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
May 20, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO STATION METER MANUFACTURERS.

THE Directors of this Company invite TENDERS for the supply and erection at their Grimesthorpe Station of a 250,000 Cubic Feet per hour STATION METER, in rectangular Cast-Iron Case.
Specification, with Form of Tender, may be obtained on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bond-fide* tender.
Sealed tenders, endorsed "Tender for Station Meter," must be delivered to the undersigned (by post) at the Company's Offices not later than the first post on Saturday, the 5th day of June, 1897.
The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
May 20, 1897.

COUNTY BOROUGH OF BURY.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation are prepared to receive TENDERS for the supply, for One, Two, or Three Years, of
3000 Tons of CANNEL per annum.
30,000 Tons of GAS COAL per annum.
500 Tons of BURGY per annum.
200 Tons of HOUSE COAL per annum.
The same to be delivered in such quantities and at such times as the Gas Engineer of the Corporation may from time to time order.
Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. W. H. S. Gendall, Engineer, Gas-Works, Bury.
Tenders, which must be on the printed Forms, and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Bury, marked "Tender for Gas Coal," to be delivered not later than the 17th of June, 1897.
Preference will be given to those persons or firms who pay to their workpeople the regular Standard Rate of Wages obtaining at the time in the Town or District.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
May 27, 1897.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Ossett Gas Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR produced at their Works during the Twelve Months ending the 30th of June, 1898.

Liquor to be quoted for both by Twaddel's and Wills's Tests.

Tenders to be sent in not later than Wednesday, June 23, 1897.

By order,
JAS. CASTLE,
Secretary.

Ossett, May 28, 1897.

SOUTH SHIELDS GAS COMPANY.

TO METER MANUFACTURERS.

THE Directors of the South Shields Gas Company invite TENDERS for the supply of DRY GAS-METERS required during the Year ending June, 1898.

The Meters must be of best quality, and delivered at the Gas-Works, carriage paid.

The Directors do not bind themselves to accept the lowest or any tender.

Form of Contract and further Particulars may be had on application.

Sealed tenders, marked "Tender for Meters," to be delivered to the undersigned not later than Friday morning, the 4th of June next.

J. H. PENNEY,
Secretary.

Gas Offices: Chapter Row,
South Shields, May 22, 1897.

CITY OF HEREFORD.

THE Gas Management Committee of the Corporation invite TENDERS for the supply of best screened large GAS COAL for One Year, from the 1st of July next, to be delivered free at the Gas-Works Siding, Hereford, in such quantities as may be required from time to time.

The estimated quantity required will be about 8000 Tons.

Full Particulars and printed Forms of Tender may be obtained on application to the undersigned.

Tenders, endorsed "Tender for Gas Coal," are to be sent in addressed to the Chairman, Gas Management Committee, Mansion House, Hereford, by Saturday, June 5.

The Committee do not bind themselves to accept the owest or any tender.

By order,
WILLIAM PARLBY,
Gas Engineer and Manager.

Gas-Works, Hereford,
May 24, 1897.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-light Company invite TENDERS for the supply of about 12,000 Tons of screened GAS COAL, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1897, and ending June 30, 1898.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.

Tenders must be made on Forms (containing further Particulars), which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 17th day of June, 1897.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 21, 1897.

BOROUGH OF ROCHDALE.

TO IRONFOUNDERS AND OTHERS.

THE Gas Committee of the above Corporation invite TENDERS for the supply and erection of two CAST-IRON TANKS, each 30 ft. by 30 ft. by 10 ft., together with Iron Roof for covering the same.

Also for supplying 30 Cast-Iron Self-Sealing Retort Mouthpieces and Lids, 20 in. by 15 in. ⌂ to 18-inch Circular.

The Drawings may be seen, and copies of the Specification for the Tanks and Roof may be obtained, on application to Mr. T. Banbury Ball, the Manager at the Gas-Works.

Tenders, endorsed "Tanks" or "Mouthpieces," as the case may be, must be sent in to me not later than Noon on Wednesday, June 9, 1897.

By order,
JAMES LEACH,
Deputy Town Clerk.

Town Hall, Rochdale,
May 28, 1897.

SCARBOROUGH GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR to be produced at their Works for One or more Years from the 1st day of July next.

Tenders for Liquor may be submitted either at a fixed price per ton or on a Sliding-Scale, regulated by the price of Sulphate. Preference will, however, be given to the latter.

Further Particulars may be obtained on application to the undersigned, to whom sealed tenders (duly endorsed) must be delivered not later than noon, on Saturday, the 12th of June next.

The Directors do not bind themselves to accept the highest or any tender.

By order of the Board,
(Signed) J. HOLLIDAY,
Engineer and Secretary.

Gas Offices: 32, Westborough,
Scarborough, May 19, 1897.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for surplus TAR. Estimated quantity, 650 Tons.

Further Particulars and Form of Tender may be obtained from Mr. W. Whatmough, Gas Manager.

Tenders, endorsed "Tar," to be sent to me not later than Tuesday, June 15, 1897.

By order,
J. H. BALDWICK,
Town Clerk.

Municipal Buildings, Heywood,
May 29, 1897.

THE Directors of the Longford Gas Company, Limited, Ireland, invite TENDERS for the supply of 500 or 600 Tons of best GAS COAL, delivered free into Midland Great Western Railway Waggons at Spencer Dock, Dublin.

Tenders will be considered on Monday, the 7th of June, and should be addressed to the Chairman, Thos. C. Maxwell, Esq., endorsed "Tender for Coal."

The lowest or any tender not binding on the Directors.

By order,
W. A. REID,
Secretary.

SURPLUS TAR AND LIQUOR.

THE Gas Committee of the Bingley Urban District Council hereby invite competent Firms to TENDER for the purchase of their surplus TAR and LIQUOR, as proposed to be manufactured at their Gas-Works, Bingley, during the Twelve Months ending June, 1898.

Forms of Tender to be obtained from the undersigned, which, when duly filled up, must be addressed to James Gatecliff, Esq., Chairman of the Committee, Town Hall, Bingley, on or before the 14th day of June, 1897.

By order,
GEORGE DUNBAR MALAM,
Engineer.

Gas-Works, Bingley,
May 11, 1897.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the supply of COAL to their Works during a period of Twelve Months ending May 31, 1898.

TENDERS are also invited for the supply of LIME during the same period.

Form of Tender and any other Particulars required may be had on application to Mr. S. S. Mellor, the Manager.

Tenders, endorsed "Coal" or "Lime," and addressed to the Chairman, must be delivered here not later than Friday, June 4, 1897.

HY. PICKERING,
Secretary.

Gas-Works, Northwich,
May 22, 1897.

WARE GASLIGHT AND COAL AND COKE COMPANY, LIMITED.

COAL SUPPLY.

THE Directors of the above Company invite TENDERS for the supply of from 900 to 1200 Tons of EAST PONTOP, NEW PELTON or PELAW MAIN GAS COALS, to be considered at their meeting to be held on Tuesday, the 1st day of June next.

Full Particulars may be obtained on application to me the undersigned at my Office.

By order,
GEO. H. GISBY,
Secretary to the Company.

Town Hall, Ware,
May 18, 1897.

GLASGOW CORPORATION GAS.

TENDERS FOR METERS.

THE Corporation of Glasgow invite TENDERS for the supply of such DRY METERS as they may require for Twelve Months from the 1st of July next.

Forms of Tender may be had on application to the Manager at the Gas Office, 45, John Street, Glasgow; and sealed offers, marked "Tender for Meters," to be addressed to, and lodged with, the subscriber on or before Tuesday, the 8th of June.

The Corporation do not bind themselves to accept the lowest or any offer.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
May 27, 1897.

TENDERS FOR GAS COAL.

THE Gas Committee of the Town Com-missioners of Newry invite TENDERS for the supply of from 3000 to 3600 Tons of GAS COAL, to be delivered in such quantities and at such times as may be required by the Committee, and delivered free *ex* Ship or Steamer at Albert Basin, Newry.

The Coal to be fresh wrought, dry, and free from Clench, Pyrites, or other objectionable matter for Gas Making.

The Committee would assist the Contractor by allowing him to deliver about 1000 Tons of Coal prior to the 1st of November next.

Further Particulars may be obtained from Mr. A. Gibb, Manager.

Sealed tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, and where raised, to be addressed to the Chairman, and delivered to the undersigned not later than Ten a.m., on Friday, the 4th of June next.

The Committee reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

By order,
R. H. DOHERTY,
Town Clerk.

New Town Hall, Newry,
May 21, 1897.

HERTFORD GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 2500 Tons of unscreened YORKSHIRE SILKSTONE GAS COAL, to be delivered as required, between the 1st of September next and the 30th of June, 1898, at the G.N. Railway Gas-Works Siding, Hertford.

A Seaborne Coal, delivered alongside Gas-Works Wharf, to be also quoted. The right of taking either Coal under the contract is reserved.

The Directors also reserve the right to divide the Contract.

Tenders, endorsed "Coal," to be sent in by the 9th of June next.

ROBT. WATSON,
Manager and Secretary.

Gas-Works, Hertford,
May 29, 1897.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the supply of the undermentioned:—

1. The whole or part of 10,000 Tons of best screened GAS COAL, 2000 Tons of CANNEL, and also a supply of the best Hand-Picked BUXTON LIME, free from Dirt and Ashes, in such quantities as may be required, to be delivered free at Macclesfield, and to weigh 20 cwt. to the ton over the Committee's Weighing-Machine at their Works.
2. Wrought-Iron Lap-Welded STEAM TUBES and FITTINGS.
3. Cast-Iron MAINS and IRREGULARS.
4. METERS.
5. LEAD PIPE.
6. BRASS TAPS and FITTINGS.

Forms of Tender and Conditions may be had on application to the Engineer, Gas-Works, Macclesfield.

Tenders, sealed and endorsed, to be sent in not later than Saturday, the 12th day of June, 1897, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.

The Committee do not pledge themselves to accept the lowest or any tender.

W. FREDK. TAYLOR,
Town Clerk.

May 10, 1897.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

TO THE SHAREHOLDERS.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices, 60, Gracechurch Street, London, E.C., on Tuesday, the 15th of June, 1897, at Twelve o'clock Noon, for the purpose of receiving the Report of the Directors and the Accounts for the Year ended the 31st of March, 1897, and for the transaction of the General Business of the Company.

One of the Directors, Mr. Stephenson Robert Clarke, retires from office, and offers himself for re-election.

The Auditors, Mr. Robert Hesketh Jones and Mr. Thomas Guyatt, retire, and offer themselves for re-election.

The TRANSFER BOOKS WILL BE CLOSED from the 1st of June until the day of the Meeting, both days inclusive.

By order,
A. W. COOPER,
Secretary.

60, Gracechurch Street, E.C.,
May 18, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

CASES FOR BINDING
VOLUMES OF THE "JOURNAL"
(GREEN CLOTH, GILT LETTERED)
MAY BE HAD FROM THE PUBLISHER
Price 2s. each.

Price 7s. 6d. per 100; £3 *per* 1000 (*Carriage Free*), *Demy 4to.*,

A LEAFLET ON

SULPHATE OF AMMONIA:

ITS SOURCE—RELATIONSHIP TO SOIL—EFFECT ON PLANTS.

By H. H. COUSINS, M.A.,
South-Eastern Agricultural College, Wye.

This is a Reprint from the "JOURNAL" of three Articles, which are of a character eminently suitable for distribution among Farmers and other users of Artificial Manures.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS
Are a great improvement on Oil, giving a good Light requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.
43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.
FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.
LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.
Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.
HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—
Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.
The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*
These Coals may be bought through the Principal Merchants in England, or direct from
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

THE STAFFORDSHIRE TUBE CO.
TELEGRAMS:
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COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

EXTRACTION APPARATUS
SPECIALLY DESIGNED
TO EXTRACT THE SULPHUR FROM SPENT OXIDE.
BUILT BY
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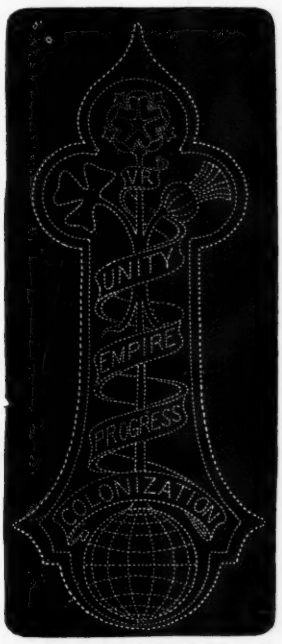
ENGINEERS AND IRONFOUNDERS.

GAS ILLUMINATION JUBILEE DEVICES.
ORDER EARLY


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PRICE LISTS ON APPLICATION
JAMES MILNE & SON
— LIMITED —
EDINBURGH, LONDON, LEEDS AND GLASGOW.

HEBBURN MAIN GAS COALS.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.
For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
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STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
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Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL
AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

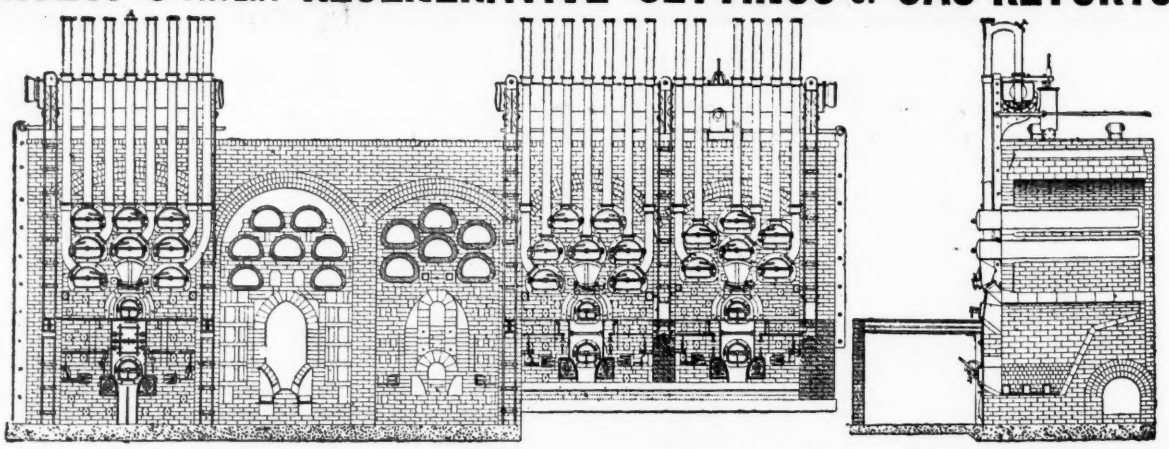
W. J. JENKINS & CO., RETFORD.

COAL UNLOADING

AND

CONVEYING MACHINERY.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

Further Information and Pamphlets from Principal Agent.

ARROL-FOULIS

PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,
DALMARNOCK IRON-WORKS, BRIDGETON,
GLASGOW.

LONDON ADDRESS: 32, VICTORIA STREET, WESTMINSTER, S.W.

PLANS AND ESTIMATES FURNISHED ON APPLICATION.

THE
ARROL-FOULIS
MACHINES
Are Employed at the following Works—

GLASGOW GAS-WORKS—
Tradeston.
Dawsholm.
Dalmarnock.

GASLIGHT & COKE COMPANY—
Beckton.

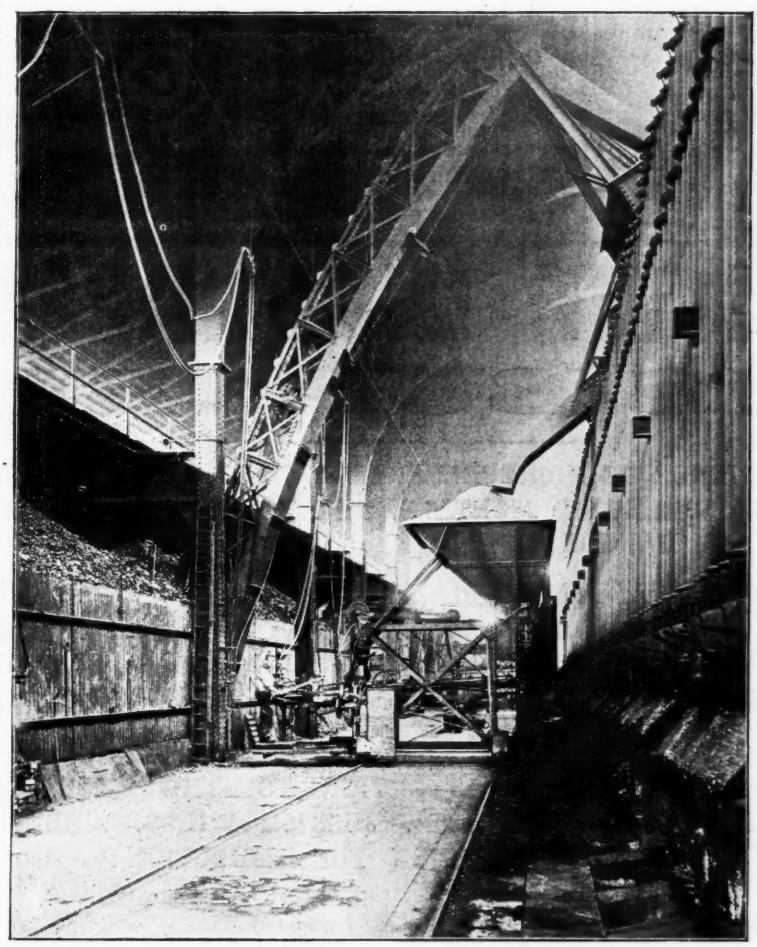
SOUTH METROPOLITAN GAS COMPANY—
East Greenwich
Vauxhall.
Rotherhithe.

COMMERCIAL GAS-WORKS—
Wapping.
Poplar.

BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.



THE
ARROL-FOULIS
MACHINES
Are Employed at the following Works—

LEEDS GAS-WORKS.

BIRMINGHAM GAS-WORKS

HULL GAS-WORKS.

BOLTON GAS-WORKS.

IMPERIAL CONTINENTAL GAS ASSOCIATION—
Amsterdam.
Vienna.

HAGUE CORPORATION GAS-WORKS—
Hague.

METROPOLITAN GAS-WORKS—
Melbourne.

CLEVELAND GAS-WORKS—
Cleveland, Ohio.
&c., &c., &c.

OVER 200 MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

BECKTON GAS-WORKS.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

ONE MINUTE.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD ST., E.C.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD
CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·23 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

SUNLIGHT INCANDESCENT GAS-BURNERS.

IN CONSEQUENCE OF MISREPRESENTATIONS WHICH HAVE BEEN CIRCULATED RESPECTING THE SUNLIGHT MANTLES, THE FOLLOWING CERTIFICATE IS NOW GIVEN WITH EVERY MANTLE:—

"The New Incandescent (Sunlight Patent) Gas Lighting Company, Limited, hereby certify that the within Mantle is in every respect similar in process of Manufacture and constituent parts or substances to the Mantle which was held by the Hon. Mr. Justice Wills **NOT TO BE AN INFRINGEMENT OF THE WELSBACH PATENTS."**

AND WE FURTHER CALL ATTENTION TO THE EXTRACTS FROM THE JUDGMENT GIVEN BY THE HON. MR. JUSTICE WILLS, WHEN HE DISMISSED THE WELSBACH COMPANY'S APPLICATION FOR INJUNCTION:—

"No use is made by the Sunlight Company of any of the rare earths; and their choice of substances, and their method of applying the illuminants, appear to me to be **as wide asunder as the Poles** from those contemplated by Welsbach."

"Welsbach Company's Counsel, both admit that they have no case unless the Welsbach skeleton, of whatever resistant earth oxides composed, is within the Welsbach Patent. It seems to me that **this is just what Welsbach did not claim.**"

PRICE LIST AND TERMS ON APPLICATION.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING Co., LIMITED.
33 & 34, Shoe Lane, London, E.C.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

ALDER AND MACKAY,

MANUFACTURERS OF

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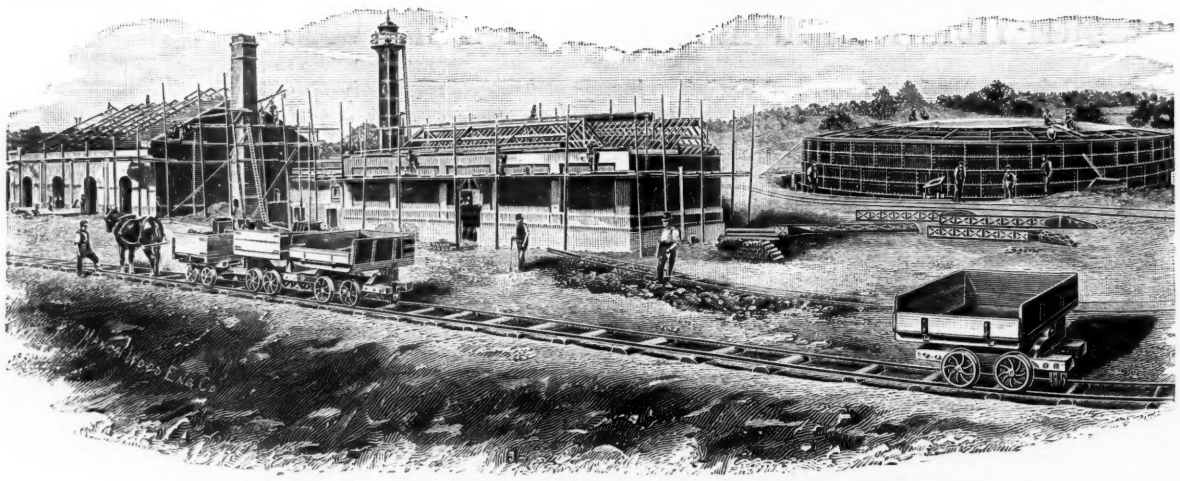

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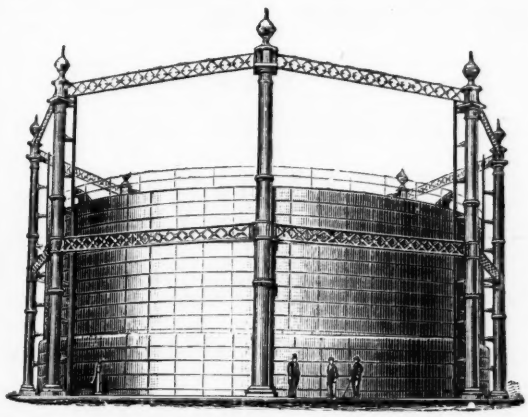

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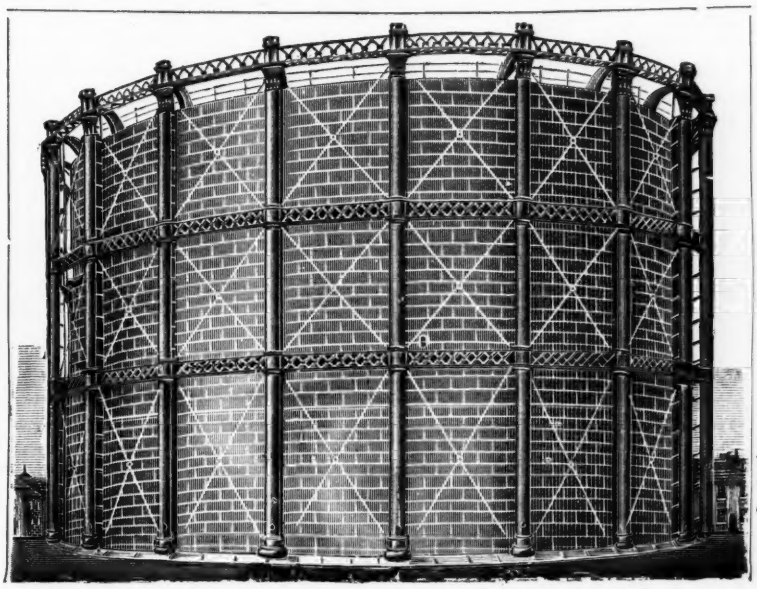

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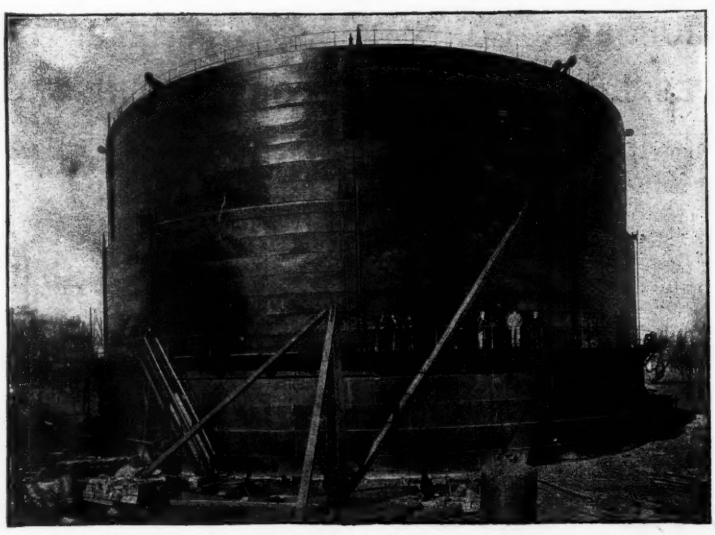

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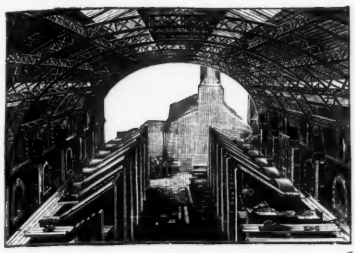

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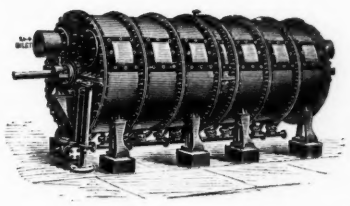

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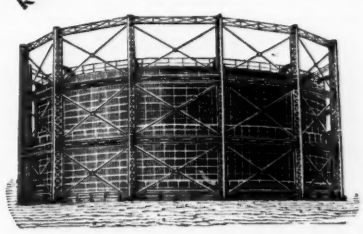

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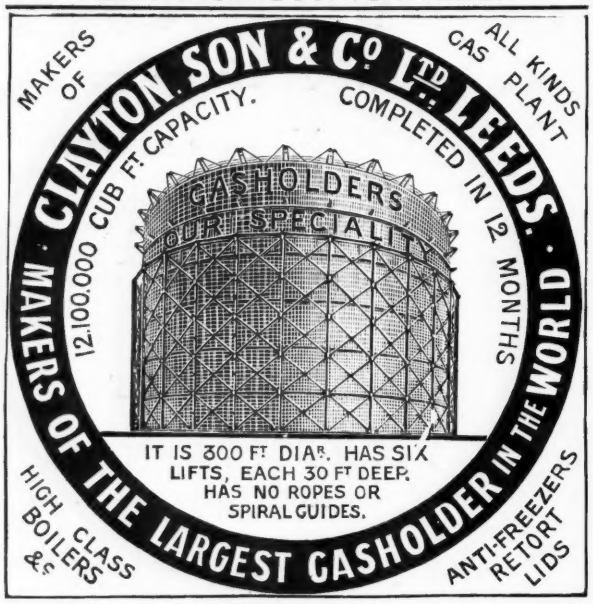
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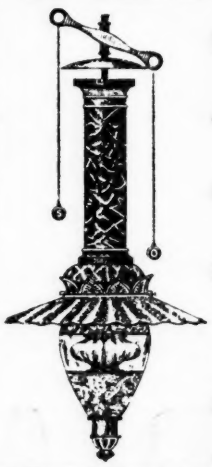

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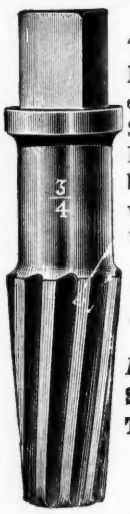

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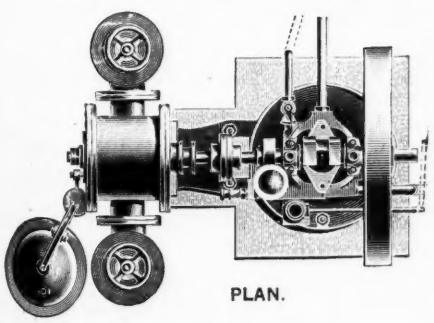

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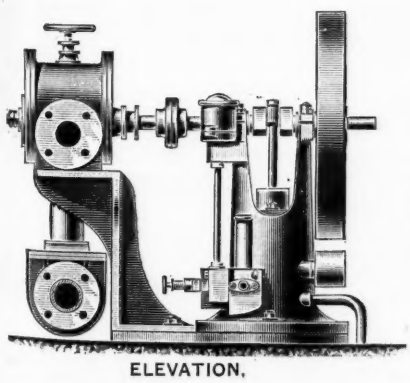

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[See also Advt. p. 1232.

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